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THE GEORGE WASHINGTON UNIVERSITY

# BULLETIN

UNDERGRADUATE AND GRADUATE PROGRAMS

1988–1989




THE GEORGE WASHINGTON UNIVERSITY CAMPUS/WASHINGTON, D.C.

THE GEORGE WASHINGTON UNIVERSITY BULLETIN
(USPS 343-070)
*Volume 87, Number 2, April 1988*

*Published by The George Washington University at Washington, D.C. 20052*
*Four times per year: Two issues in April and one each in July and November*

*Second Class Postage Paid at Washington, D.C.*

*POSTMASTER: Please send changes of address to The George Washington University Mail Service, 2025 F Street, N.W., Washington, D.C. 20052.*

THE GEORGE WASHINGTON UNIVERSITY BULLETIN

# UNDERGRADUATE AND GRADUATE PROGRAMS
## 1988–1989

**Columbian College of Arts and Sciences**

**Graduate School of Arts and Sciences**

**School of Education and Human Development**

**School of Government and Business Administration**

**School of International Affairs**

**Division of Continuing Education**

For information concerning the School of Engineering and Applied Science, the National Law Center, or the School of Medicine and Health Sciences, please request the appropriate bulletin.

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# THE CALENDAR 1988–1989*

**August 1988**

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**April 1989**

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**May 1989**

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**1988 FALL SEMESTER**

*August 23–24* Orientation for students from foreign countries

*August 25–26* Orientation and placement tests for new students

†*August 29–31* Registration

*September 1* Classes begin

*September 5* Labor Day (holiday)

*September 7* University Faculty Assembly meeting

*September 9* Fall Convocation

*September 16* Faculty Senate meeting

*October 1* Applications due for February graduation
Applications due for November Master's Comprehensive Examinations in the School of International Affairs and in the School of Government and Business Administration

*October 14* Faculty Senate meeting

*October 20* Board of Trustees meeting

*November 1* Applications due for spring semester financial aid

*November 4* Applications due for Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations

*The Academic Calendar is subject to change.
†The registration procedure and the hours of registration are stated in the *Schedule of Classes*, which is available in advance of each semester.

| | |
|---|---|
| *November 4–5* | School of International Affairs and School of Government and Business Administration Master's Comprehensive Examinations |
| *November 11* | Faculty Senate meeting |
| *November 24–25* | Thanksgiving holiday |
| *November 28* | Doctoral dissertations due from February candidates in the Graduate School of Arts and Sciences, the School of Education and Human Development, and the School of Government and Business Administration |
| *December 3* | Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations |
| *December 8* | Last day of fall semester classes |
| *December 9* | Faculty Senate meeting |
| *December 12–20* | Examination period |

**1989 SPRING SEMESTER**

| | |
|---|---|
| *January 3* | Orientation for new students and students from foreign countries<br>Master's theses due from February candidates |
| *January 4* | All degree requirements to be completed and reported to the Graduate School of Arts and Sciences for February graduation |
| **January 4–6* | Registration |
| *January 9* | Spring semester classes begin |
| *January 13* | Faculty Senate meeting |
| *January 16* | Martin Luther King Day (holiday) |
| *January 19* | Board of Trustees meeting |
| *January 20* | Inauguration Day (holiday) |
| *January 24* | University Faculty Assembly meeting |
| *February 1* | Applications due for May graduation |
| *February 10* | Faculty Senate meeting |
| *February 19* | Winter Convocation |
| *February 20* | George Washington's birthday observed (holiday) |
| *February 22* | Applications due for April Master's Comprehensive Examinations in the School of International Affairs and the School of Government and Business Administration |
| *February 24* | Doctoral dissertations due from May candidates in the Graduate School of Arts and Sciences and the School of Education and Human Development |
| *March 1* | Deadline for submission of 1989–90 undergraduate financial aid applications |
| *March 10* | Applications due for Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations<br>Faculty Senate meeting |
| *March 13–17* | Spring recess |
| *March 16* | Board of Trustees meeting |
| *March 20* | Doctoral dissertations due from May candidates in the School of Government and Business Administration |
| *April 1* | Deadline for submission of summer sessions and 1989–90 graduate financial aid applications |

* The registration procedure and the hours of registration are stated in the *Schedule of Classes* which is available in advance of each semester.

| | |
|---|---|
| *April 7–8* | School of Government and Business Administration and School of International Affairs Master's Comprehensive Examinations |
| *April 8* | Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations |
| *April 9* | Honors Convocation |
| *April 10* | Master's theses due from all May candidates except those in the School of International Affairs |
| *April 13* | All degree requirements to be completed and reported to the Graduate School of Arts and Sciences for May graduation |
| *April 14* | Faculty Senate meeting |
| *April 24* | Last day of spring semester classes<br>Master's theses due from May candidates in the School of International Affairs |
| *April 28–May 6* | Examination period |
| *May 5* | Faculty Senate meeting |
| *May 7* | Commencement |
| *May 18* | Board of Trustees meeting |

## FACTS ABOUT GEORGE WASHINGTON UNIVERSITY

| | |
|---|---|
| *General Information* | Private, nonsectarian, coeducationa founded 1821 |
| *Location* | Washington, D.C., bounded by Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. |
| *Number of On-campus Students* | 9,895 full-time; 7,078 part-time |
| *Geographical Origin of Students* | 50 states, District of Columbia, and over 100 countries |
| *1988–89 Tuition* | $358 per semester hour, to a maximum of $9,570 per academic year (see pages 27–31) |
| *Number of Full-time Faculty* | 1,198 (91% with doctoral degrees) |
| *Number of Part-time Faculty* | 524 (includes some of the most distinguished men and women in Washington) |
| *Room and Board* | Cost varies from approximately $4, to $5,700 for the academic year (see pages 58–59) |

*Undergraduate majors:* Accountancy, American Civilization, American Litera Anthropology, Applied Mathematics, Art History, Biology, Botany, Business Admini tion, Cartography, Chemistry, Chinese Language and Literature, Civil Enginee Classical Archaeology and Anthropology, Classical Archaeology and Classics, Clas Humanities, Computer and Information Systems, Computer Science, Criminal Jus Dance, Early Modern European Studies, East Asian Studies (China or Japan), Econo Electrical Engineering, Elementary Education, Emergency Medical Services, En Literature, Environmental Studies, Exercise and Sport Science, Fine Arts, Fr Language and Literature, Geography, Geology, Germanic Languages and Literat History, Human Services, International Affairs, Journalism, Judaic Studies, Latin A can Studies, Liberal Arts, Literature in English, Mathematics, Mechanical Enginee Medical Record Administration, Medical Technology, Middle Eastern Studies, M Nursing Anesthesia, Philosophy, Physician Assistant, Physics, Political Commu tions, Political Science, Psychology, Radio–Television, Radiologic Sciences and Ad istration, Religion, Russian Language and Literature, Russian Literature and Culture Translation, Sociology, Spanish-American Literature, Spanish Language and Liters Special Education, Speech Communication, Speech and Hearing Science, Stati Systems Analysis and Engineering, Theatre, Travel and Tourism, Zoology

*Study leading to graduate or professional degrees is offered* in the Graduate Scho Arts and Sciences, the National Law Center, the School of Medicine and Health Scie the School of Engineering and Applied Science, the School of Education and Hu Development, the School of Government and Business Administration, and the Sch International Affairs.

# THE UNIVERSITY

## HISTORY

The George Washington University had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company, "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended a "fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter, which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half-century, the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area has many reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he hoped to see established.

## PURPOSE AND OBJECTIVES

The purpose of The George Washington University was to realize "th aspirations of Washington, Jefferson and Madison, for the erection of university at the seat of the Federal Government." Over the years it has been th aim to develop the University ideal in the nation's capital with a view towar meeting the changing needs of society while continuing to pursue the tradition al principles of learning and research.

The George Washington University now rededicates itself and all th resources at its command to the pursuit of knowledge and its dissemination.

To this end:

The University recognizes its special opportunities in and obligations to on of the principal capitals of the world. It is a primary objective of the Universit to utilize its historical, geographical, and functional relationship to the nation' capital and the Washington community in continuing the development of great nationally and internationally oriented university.

The University recognizes the needs of our times and accepts the challenge t develop each student's potential abilities to the fullest extent.

The University is and should remain privately controlled, nonsectarian, an coeducational.

Admission to the University is determined only in terms of the persona character and academic qualifications of the candidates.

A broadly based liberal education is fundamental to the total program of th University.

Expansion of graduate and professional studies and research and the utiliza tion for this purpose of the excellent research facilities and materials available in the nation's capital are basic to the continuous development of th University's educational program.

The provision of superior instruction and facilities and the application o high standards of entrance qualifications and academic achievement to al students whether full-time or part-time, on-campus or off-campus, are majo missions of the University.

A balanced program of student extracurricular activities is an integral part o the University program.

The University will continue to strive to meet the evident needs of a enlarged student body while governing the size of enrollment by its capacity t supply adequate staff and facilities for the excellent teaching and research tha it espouses.

## THE COLLEGES, SCHOOLS, AND DIVISIONS

George Washington University includes nine colleges, schools, and divisions as follows:

*Columbian College of Arts and Sciences** offers four-year programs in th arts and sciences leading to the degrees of Bachelor of Arts, Bachelor o Science, and Bachelor of Music. The College also provides prelegal an premedical programs and the preprofessional work required for admission t the School of International Affairs.

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* Columbian College of Arts and Sciences cooperates with the School of Medicine and Healt Sciences in offering a program leading to the combined degrees of Bachelor of Arts and Doct of Medicine.

*The Graduate School of Arts and Sciences*† offers advanced study and esearch leading to the degrees of Master of Arts, Master of Fine Arts, Master of orensic Sciences, Master of Music, Master of Science, Master of Science in orensic Science, Master of Science for Teachers, and Doctor of Philosophy. he degrees of Master of Arts and Master of Science are also available through ff-campus programs administered by the Division of Continuing Education.

*The School of Medicine and Health Sciences**‡ offers work leading to the egrees of Associate in Science, Bachelor of Science, Bachelor of Science in ealth Science, Master of Public Health, and Doctor of Medicine.

*The National Law Center*† offers courses leading to the degrees of Juris octor, Master of Laws, Master of Comparative Law, Master of Comparative aw (American Practice), and Doctor of Juridical Science and special programs Continuing Legal Education.

*The School of Engineering and Applied Science* offers courses leading to the egree of Bachelor of Science in the following areas: civil engineering, mputer science, electrical engineering, mechanical engineering, and systems nalysis and engineering. Graduate programs lead to the degrees of Master of cience, Master of Engineering Administration, Engineer, Applied Scientist, nd Doctor of Science. The School has academic jurisdiction over the off-ampus programs leading to the degrees of Master of Science, Master of ngineering Administration, and Doctor of Science. These off-campus pro-rams are administered by the Division of Continuing Education.

*The School of Education and Human Development* offers undergraduate rograms leading to the degrees of Bachelor of Arts in Education and Human evelopment and Bachelor of Science in Human Kinetics and Leisure Studies nd graduate studies leading to the degrees of Master of Arts in Education and uman Development, Master of Arts in Teaching, Master of Education, ducation Specialist, and Doctor of Education. The degree of Master of Arts in ducation and Human Development is also available through off-campus rograms administered by the Division of Continuing Education.

*The School of Government and Business Administration*† offers undergradu-e programs leading to the degrees of Bachelor of Accountancy and Bachelor of usiness Administration and graduate programs leading to the degrees of aster of Accountancy, Master of Association Management, Master of Business dministration, Master of Health Services Administration, Master of Public dministration, Master of Science in Information Systems Technology, Master Taxation, Master of Urban and Regional Planning, Specialist in Health ervices Administration, and Doctor of Philosophy.

*The School of International Affairs*† offers undergraduate programs leading the degree of Bachelor of Arts and graduate programs leading to the degree of aster of Arts.

*The Division of Continuing Education* assists in providing continuing ucation programs for adult students by administering or coordinating the off-

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he Graduate School of Arts and Sciences cooperates with the School of Medicine and alth Sciences in offering programs leading to the joint degrees of Master of Science–Doctor of edicine and Doctor of Medicine–Doctor of Philosophy.

he National Law Center cooperates with the School of International Affairs, the Graduate hool of Arts and Sciences, and the School of Government and Business Administration in ering programs leading to joint Juris Doctor and master's degrees.

olumbian College of Arts and Sciences cooperates with the School of Medicine and Health ences in offering a program leading to the combined degrees of Bachelor of Arts and Doctor Medicine.

campus credit offerings of the colleges and schools of the University, at both undergraduate and graduate levels. Noncredit courses are also offered throu the Division.

## ACADEMIC STATUS

George Washington University is accredited by its regional accrediting agen the Middle States Association of Colleges and Schools.

The University is on the approved list of the American Association University Women and is a member of the College Board.

The National Law Center is a charter member of the Association of Americ Law Schools and is approved by the Section of Legal Education and Adm sions to the Bar of the American Bar Association. The School of Medicine a Health Sciences has had continuous approval by its accrediting body, which currently the Liaison Committee on Medical Education, sponsored jointly the American Medical Association and the Association of American Medi Colleges. All undergraduate engineering curricula, including the compu engineering option, of the School of Engineering and Applied Science accredited by the Engineering Accreditation Commission of the Accreditati Board for Engineering and Technology. The computer science curriculum accredited by the Computer Science Accreditation Commission of the Comp ing Sciences Accreditation Board. The School of Education and Hum Development is a charter member of the American Association of Colleges Teacher Education and is accredited by the National Council for Accreditati of Teacher Education for its eligible bachelor's, master's, and doctoral deg programs; the School's counseling programs are accredited by the Council the Accreditation of Counseling and Related Educational Programs and Council on Rehabilitation Education. The School of Government and Busine Administration has maintained full membership in the Middle Atlantic Asso ation of Colleges of Business Administration since 1961. It joined the Coun on Graduate Education for Public Administration in 1966. In 1968, the Sch became a member of the American Assembly of Collegiate Schools of Busine the Assembly accredited its undergraduate program in 1977 and its maste program in 1982. The programs in accountancy satisfy the educational requi ments for the Certified Public Accountant and the Certified Managem Accountant professional examinations. The program in health services adm istration is accredited by the Accrediting Commission on Education for Hea Services Administration. The Master of Public Administration program is the approved list of the National Association of Schools of Public Affairs a Administration. The Master of Urban and Regional Planning degree program recognized by the American Planning Association. The Department of Chem try is on the approved list of the American Chemical Society. The Departm of Music is an accredited member of the National Association of Schools Music. The graduate program in clinical psychology in the Department Psychology is on the approved list of the American Psychological Associati The graduate program in speech–language pathology and audiology is accred ed by the Education and Training Board of the Boards of Examiners in Speec Language Pathology and Audiology.

## UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on basis of race, color, religion, sex, national origin, age, handicap, or vete status. This policy covers all programs, services, policies, and procedures of

University, including admission to education programs and employment. The University is subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Dr. Marianne R. Phelps, Associate Provost, George Washington University, Rice Hall, Washington, D.C. 20052, (202)994-6508, or to the Assistant Secretary for Civil Rights of the Department of Education.

## LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the Corcoran Gallery of Art, the Department of State, the National Academy of Sciences, the John F. Kennedy Center for the Performing Arts, and many other governmental and cultural institutions.

## THE UNIVERSITY LIBRARIES

The library collections of the University are housed in the Melvin Gelman Library (the general library of the University) and in the libraries of the National Law Center and the School of Medicine and Health Sciences.

These collections contain approximately 1,540,000 volumes, to which are added some 60,000 volumes a year. Endowments supplementing the University appropriation provide research materials in the fields of American civilization, American literature, art history, foreign service, history, labor relations, public finance, the social sciences, and transportation. Gifts from many sources have enriched the collections, including a large National Endowment for the Humanities grant to strengthen the University's humanities holdings. The libraries currently receive about 15,000 serials.

Information concerning the use of the libraries may be obtained at library service desks. Individual and class instruction in the use of the library and orientation to library facilities are given by librarians upon request.

The library strives to fulfill the curricular, research, and recreational needs and interests of the students. Through computerized searches of bibliographic data bases, the reference staff identifies and locates desired research materials not easily found through more traditional methods. The staff assists all members of the University in using the rich resources of the Washington area and the unusual opportunities they offer for extensive research.

Graduate degree candidates at George Washington University may, upon application, be issued a Consortium library card that permits direct borrowing from the main campus libraries of most other academic institutions in the Washington area. Graduate students may also obtain books and journal articles on interlibrary loan from other libraries in the city, throughout the United States, and in various other countries.

## THE BOARD OF TRUSTEES OF THE UNIVERSITY

The University is privately endowed and is governed by a Board of Trustees of which the President of the University is an *ex officio* member.

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Franklin J. Lunding, LL.B., LL.D.
James M. Mitchell, M.A.
Godfrey L. Munter, B.A., LL.B., LL.D.
Orville F. Rush, J.D., LL.D.

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* Alumni trustee.

Charles E. Smith, D.P.S., L.H.D.
Watson W. Wise, Ph.B., Litt.D.
Joseph S. Wright, LL.B., LL.D.

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Norayr Krikor Khatcheressian, Ph.D., *Assistant Dean of Columbian College Arts and Sciences, for Student Services*
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Charles Edward Rice, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*
David Alton Rowley, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*

arrett Michael Wise, B.S., *Assistant Dean in the School of Medicine and Health Sciences*
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Marlana R. Valdez, J.D., *Assistant Dean of the National Law Center, for Student and Administrative Affairs*
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ames Costantino, Ph.D., *Assistant Dean of the Division of Continuing Education*
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Billie Jo Moreland, Ed.D., *Assistant Dean of the Division of Continuing Education*
Gayle E. Schou, Ed.D., *Assistant Dean of the Division of Continuing Education*
Abbie O. Smith, Ed.D., *Assistant Dean of the Division of Continuing Education*

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**tudent–Faculty Committee on Appeals:** C.B. Craver (*Chairman*), L.T. Bowles, V. oleman, H.E. Yeide, four student members

**ommittee on Religious Life:** R.E. Kennedy, Jr. (*Chairman*), C.J. Derricotte, E.A. isher, M.D. Ticktin, H.E. Yeide, A.M. Yezer, L.J. Strong (*ex officio*), R.E. ickman (*ex officio*), J.S. Rodenstein (*ex officio*), five student members

**ommittee on Student Publications:** E.J. Englander (*Chairman*), C.B. Craver, C.J. IcSwain, B. Nolan, L. Panyon, C.W. Puffenbarger, S.A. Quitslund, M. Soltan, . Moshavi (*ex officio*), eight student members

**ommittee on the University Bookstore:** C.J. Deering (*Chairman*), M.V. Dow, M. eich, three student members

**ommittee on Federal Educational Allowances:** H. Solomon (*Chairman*), R.S. rench, C.M. Lovett, L.H. Elliott (*ex officio*), W.D. Johnson (*ex officio*)

**ommittee on Coordinated Planning:** W.D. Johnson (*Chairman*), A.B. Cambel, .E. Diehl, R.W. Eldridge, R.S. French, N.M. Loeser, M.J. Worth, A.M. Yezer, I.R. Phelps (*ex officio*), two student members

**ommittee on Research:** H. Solomon (*Chairman*), M. Atkin, A.I. El-Ansary, R.S. rench, S.E. Haber, C.J. Lange, D.R. Lehman, M.N. Rashid, L.F. Robinson, N.D. ingpurwalla, D.G. White, C.A. Garris, M. Jackson (*ex officio*)

**ommittee on Sponsored Research:** M. Belin, B.L. Berman, R.C. Cottrell, A.C. ollinshead, J.F. Lewis, R.C. Waters, C.A. Garris, M. Jackson (*ex officio*), C.J. ange (*ex officio*), A.E. Parrish (*ex officio*), six student members

**ommittee on Research on Humans:** E. Abravanel (*Chairman*), J.W. Hillis, C.J. ange, P.H.M. Lengermann, A.E. Parrish, P.J. Poppen, M.N. Rashid, S.E.

Steinbach, (*representative of the American Council on Education*), P.W. Wirt
C.A. Garris

**Committee on Hazardous Materials:** C.E. O'Rear (*Chairman*), H.R. Brasse, R.F.
Burch, C.W. Goode, G.W. McIntyre, R. Packer, T.P. Perros, L.F. Robinson, F.R.
Siegel, W.D. Sloan, Jr., D.S. Smith, C.J. Lange (*ex officio*)

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Runyon (*ex officio*), four student members

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P.M. Kelley, C.J. Lange, D.H. McElveen, S.L. Simons, M.J. Warner, R.F.
Dickman (*ex officio*), C.W. Goode (*ex officio*), three student members

## THE FACULTY SENATE 1987–88

*Jerome Aure Barron
Simon Ya Berkovich
*Philip Stanley Birnbaum
James Franklin Burks
John Cibinic, Jr.
Barkley Clark
Victor Hugo Cohn
Christopher James Deering
*Maurice Alden East
Mervyn L. Elgart
*Lloyd Hartman Elliott
Raymond Richard Fox
*Roderick Stuart French
*John Matthew Gaglione
Charles Alexander Garris
Phillip Donald Grub
Arthur David Kirsch
Joseph Benjamin Levy
*Harold Liebowitz
*Norma Maine Loeser
*Clara Maria Lovett
Dorothy Adele Moore
John Andrew Morgan, Jr.
Salvatore Rocco Paratore
Howard Clemeth Pierpont
Philip Norman Reeves
Philip Robbins
†Lilien Filipovitch Robinson
Stefan Otto Schiff
*Jay R. Shotel
Suzanne Lee Simons
Arthur Hall Smith
George Wilson Smith
*Henry Solomon
Susan J. Tolchin
Anthony Marvin Yezer
Luize Elizabeth Zubrow

Roger E. Schechter, *Parliamentarian*

* Ex officio member
† Chairman of the Executive Committee

## ADMISSIONS

The University is coeducational and accepts applications for admission at the beginning of each semester and summer session.

An application for admission to degree candidacy should be accompanied by a $30 (for undergraduate study) or $25 (for graduate study) application fee.* The application fee is waived for graduates of this University applying to the Graduate School of Arts and Sciences and for students applying for readmission who were registered as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

Applicants are urged to submit the application form and complete credentials well in advance of the semester or summer session for which they seek admission. Specific dates are given in each section below.

Acceptance is based on available space and evidence of potential for successful study. The following criteria are considered: degree or major objective related to rigor of program and grades achieved in secondary school or previous college, standardized test scores, relationship between grades and test scores, and recommendations.

The University reserves the right to refuse admission to any student with an academic record that indicates doubtful ability to succeed in college. In the evaluation process, there is no discrimination on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status.

### UNDERGRADUATE ADMISSION†

Application forms for admission or readmission to undergraduate or nondegree status are available from and should be returned to the Office of Admissions, George Washington University, Washington, D.C. 20052.

#### Secondary School Students

Applicants who wish to begin college in a summer session or in the fall semester should apply during the fall term of the senior year in high school. Preference will be given to students who submit applications and required credentials prior to March 1. Students graduating at mid-year who wish to begin college in the spring semester should apply no later than November 1.

Applicants from secondary schools must arrange to have sent directly from their schools to the Office of Admissions a complete academic record together with a personal evaluation and recommendation from the principal. This information should be supplied on a standard form used by the secondary school.

*Entrance Examinations*—Applicants from secondary schools must submit scores on the College Board Achievement Tests in English composition and mathematics and on the Scholastic Aptitude Test (SAT) or on the American College Testing (ACT) battery. Score reports must be sent directly to the Office of Admissions from the testing agency.

*Early Notification*—Although decisions on most applications for the fall semester will require submission of seventh-term grades and senior-year test scores, an earlier decision will be given after November 1 to students whose

*Application fee must be by check or postal money order, payable to The George Washington University.

†For detailed admission requirements see the appropriate college or school in this *Bulletin*. See pages 24–25 for admission requirements for students from foreign institutions.

applications become complete with secondary school records through th junior year and junior-year test scores, provided these records clearly establi admissibility.

*Early Admission Plan*—Exceptionally well-prepared students who hav completed the junior year in high school may apply for early admission. Th plan is designed for students with the emotional maturity, as well as th academic ability and background, necessary for college entrance. In most case applicants accepted for early admission have exhausted academic offerings secondary school to the extent that remaining for the senior year is not in t best interests of the students or their schools.

To be considered for early admission, students must

1. demonstrate superior academic performance through the junior year high school;
2. meet the entrance requirements of the college or division applied to, completing all required entrance units with the possible exception of the four year of English;
3. have the unqualified recommendation of the secondary school princip or counselor;
4. submit two letters of recommendation (in addition to the counselor from teachers who can testify to the student's maturity and general readiness enter college;
5. submit a letter from a parent or guardian supporting early colle entrance;
6. arrange to have SAT or ACT scores sent directly to the Office Admissions by the testing agency;
7. take the College Board Achievement Tests in English composition a mathematics and one other Achievement Test (of the student's choice) a arrange to have the scores sent directly to the Office of Admissions by t testing agency.

### Transfer Students

Undergraduate students from other institutions should submit applicatio and required credentials prior to June 1 for the fall semester, November 1 the spring semester, and April 1 for the summer sessions.

To be accepted for transfer, a student must be in good standing as scholarship and conduct at all postsecondary institutions previously attende A student who has been academically dismissed will not normally be cons ered for admission.

An applicant who has attended one or more institutions of higher educati must request each registrar to mail directly to the Office of Admissions transcript of his or her record, *even if credits were not earned.*

If an applicant has fewer than 30 semester hours of acceptable work (C better in transferable academic courses from an accredited institution) at t time the application is submitted, his or her high school record and Colle Board or ACT test scores must be sent to the Office of Admissions directly fr the high school and testing agency.

### Advance Tuition Deposit

After notification of acceptance, a $100 advance tuition deposit will required of all full-time undergraduate students, including those readmitt This deposit is not due until May 1 for students entering in the fall semeste until December 15 for students entering in the spring semester. The deposi credited toward tuition and is not refundable.

## vanced Standing and Advanced Placement

### EDIT FROM INSTITUTIONS OF HIGHER LEARNING

here there is no duplication involved, either through course work or mination, credit may be granted for work successfully completed at other titutions of higher learning. Assignment of transfer credit will depend on the propriateness of the courses completed elsewhere, the standing of the titution at which the previous work was completed, and the regulations of division of this University in which the credit is to be applied toward a gree. Transfer credit must satisfy the requirements for the degree sought as ted in this *Bulletin*. Credit may be accepted provisionally or may require idation by examination or completion of higher-level courses in the same uence. Transfer credit will not be assigned for courses completed with a v-pass grade (*D* or the equivalent); *advanced* professional (engineering, ucation, business) courses unless such courses are required for the student's VU degree (credit for professional courses is limited to 9 semester hours in lumbian College); course work completed in vocational/technical programs g., secretarial studies); sub-freshman-level remedial work.

n the School of Government and Business Administration, there is a itation of three semester hours per course to be assigned for work completed another institution; students transferring to that school from two-year leges will receive no more than 60 semester hours of credit to be applied to gree programs at this University. Columbian College of Arts and Sciences d the School of International Affairs accept a maximum of 66 semester hours credit from two-year colleges. The School of Education and Human Develop- nt will accept no more than 63 semester hours of such credit.

All transfer students must satisfy the residence and course requirements for grees sought at this University.

### EDIT BY EXAMINATION, FROM SERVICE SCHOOLS, FROM NONCOLLEGIATE GANIZATIONS, AND BY NONTRADITIONAL METHODS

suming there is no duplication of course work, a maximum of 30 semester urs of credit may be assigned upon admission to the University for any nbination of the following except as noted below.

*College Board Advanced Placement (AP) Tests*—On the basis of a score ort sent to the Office of Admissions from the Educational Testing Service at student's request, credit is assigned for scores of four or five on all vanced Placement Tests except the test in Studio Art, for which no credit is arded. Examinations passed with scores of three may be considered for dit or placement if the student arranges to have the examination booklet sent he Office of Admissions. The Advanced Placement Tests are administered the secondary schools in May of each year. Normally only students who nplete a course designated as Advanced Placement are prepared for the mination. Arrangements for the examination are the responsibility of the plicant and should be made through the secondary school attended or with Program Director, College Board, Advanced Placement Tests, CN 6671, nceton, N.J. 08541–6671.

*College Board College-Level Examination Program (CLEP)*—CLEP offers two es of examinations: General and Subject Examinations. CLEP General minations are offered in five areas: English composition, humanities, thematics, natural sciences, and social sciences and history. CLEP Subject minations measure achievement in specific college-level courses and are ered in 30 subjects.

Credit is assigned for the General Examinations, with the exception of th English composition examination, passed at approximately the 50th percenti or above.

Credit is assigned, with some exceptions, for the Subject Examinatio passed at the level recommended in the College Board model policy.* student registered in a degree program at this University must seek departme tal and dean's approval *prior* to taking a CLEP Subject Examination for credit be applied toward the degree. Credit may not be earned by passing th examination after having taken an equivalent course. Arrangements for t examinations are the responsibility of the student and should be made with t College Board College-Level Examination Program, CN 6601, Princeton, N 08541–6601.

*Special Departmental Examinations for Undergraduates*—Credit may assigned for Special Departmental Examinations administered by Columbi College departments to students enrolled in all undergraduate divisions of t University; see page 71.

*Credit Earned Through USAFI and DANTES*—Except to students enrolled the School of Government and Business Administration, credit is assigned approved United States Armed Forces Institute (USAFI) and Defense Activ for Nontraditional Education Support (DANTES) courses.

*Credit from Service Schools*—Except to undergraduates admitted to t School of Government and Business Administration, a limited amount of cre may be assigned for selected service school courses. Students seeking su credit should consult the Office of Admissions.

*Credit for Courses Offered by Noncollegiate Organizations*—Except to und graduates admitted to the School of Government and Business Administrati a limited amount of credit may be assigned for selected courses offered noncollegiate organizations. The University accepts some recommendatio published in the *National Guide to Credit Recommended for Noncollegi Courses*. Students who wish to know whether courses offered by their empl ers can be considered for credit should inquire at the Office of Admissio Courses containing fewer than 30 hours of class instruction are not review Records, which vary with the sponsoring organization, will be required.

*Credit for Courses Offered Through Correspondence and Television*—Exc to undergraduates admitted to the School of Government and Business Adm istration, a limited amount of credit may be assigned for selected courses tau by nontraditional methods, provided that such courses require the stude physical presence during a monitored final examination. Assignment of s credit will require a statement from the sponsoring agency that such examination was a required part of the course.

## ADVANCED PLACEMENT OR WAIVER BY EXAMINATION

Advanced placement or waiver of a requirement will be granted on the bas scores on Achievement Tests of the College Board as follows:

| Achievement Test | Minimum Score | Exemption |
|---|---|---|
| English Composition | 650 | Waives Engl 10 |
| European and/or American History | 600 | Waives Hist 39–40 and/or 71–72 |

* See page 124 for specific restrictions on CLEP credit for applicants to the School of Government and Bu Administration.

| | | |
|---|---|---|
| ach | 650 | |
| man | 600 | |
| rew | 600 | Waives a two-year language requirement |
| n | 600 | |
| sian | 700 | |
| nish | 650 | |

ore of 58 or above on the SAT Test of Standard Written English, or a score 3 or above on the ACT English Usage Test, will waive English 10.
dvanced standing (academic credit) is not assigned on the basis of SAT, , or Achievement Test results.

## ADUATE ADMISSION*

*raduate School of Arts and Sciences*—Application forms for admission or mission are available at the Office of the Dean of the Graduate School of and Sciences, George Washington University, Washington, D.C. 20052. pleted applications and requests for fellowship support must be submitted he dates indicated on the Graduate School's application information. lications for graduate study without fellowship support must be received ily 1 for the fall semester, by November 1 for the spring semester, and by l 15 for the summer session, unless otherwise noted on the Graduate ol's application information. Applications are acceptable after these dates eview and possible admission in the corresponding semester only if time its and if space is available in the program desired.

*hool of Education and Human Development*—Application forms for ission or readmission are available at the Office of the Dean of the School of cation and Human Development, George Washington University, Washing- D.C. 20052. Completed application forms should be submitted to that e no later than June 1 for the fall semester, November 1 for the spring ester, and April 1 for the summer sessions, unless an extension is granted ae office of the dean.

*hool of Government and Business Administration*—Application forms for ission or readmission are available at the Office of Enrollment Develop- and Admissions, School of Government and Business Administration, ge Washington University, Washington, D.C. 20052. The Application for uate Degree Candidacy shows the deadlines for applications to the uate programs offered by this school.

*hool of International Affairs*—Application forms for admission or read- ion are available at the Graduate Admissions Office, School of Internation- fairs, George Washington University, Washington, D.C. 20052. Completed ication forms should be submitted to that office no later than February 1 uary 15 for foreign applicants and applicants for graduate fellowship or tantships). Admission is for the fall semester only. All credentials, ding transcripts from all institutions attended, Graduate Record Examina- scores, and letters of reference, must be received before the deadline date.

## SION OF CONTINUING EDUCATION

Office of University Students in the Division of Continuing Education es on-campus credit courses available to *nondegree students*. Application s for admission to nondegree status in this Division are available from and ld be returned to the Office of Admissions, George Washington University,

*tailed admission requirements, see the appropriate school in this *Bulletin*

Washington, D.C. 20052. Completed application forms and any credenti
required should be received by the Office of Admissions no later than
Friday before the first day of registration (see Calendar, page 5). To av
paying a late registration fee, applicants should make sure that all necess
forms and credentials are in the Office of Admissions prior to registrati
There is no fee for applying to this Division. For detailed entrance requ
ments, see page 167.

Students in this Division may not take accountancy, business administrati
or management science courses; registration in other courses may be den
students in nondegree status when space is needed for degree students.

With the exception of the School of Government and Business Adminis
tion, which limits a student to 15 semester hours earned in nonmatricul
status, a maximum of 45 semester hours earned in the Division of Contin
Education may be applied toward a bachelor's degree in the other undergra
ate degree-granting colleges or schools of the University.

## READMISSION

Previously registered students who wish to resume studies on campus
discontinuing enrollment for one or more semesters (summer sessions exc
ed) must apply for readmission. Deadlines for readmission applications
students in good academic standing are the same as those for new applica
(see pages 19–20 and 23–24). Students who discontinued enrollment whi
academic probation or under suspension should allow at least one mont
appropriate processing of readmission credentials. Students seeking reac
sion after having attended other institutions of higher education in the in
must have complete official transcripts sent to the appropriate office a
University from all other institutions attended. Students seeking readmi
as degree candidates after previous enrollment in nondegree status
submit all entrance credentials not previously received or required.

Applicants for readmission are subject to the University regulations in
at the time of readmission.

The application fee is waived for students applying for readmission
previous enrollment as degree candidates at this University if they hav
since registered at another institution.

## STUDENTS FROM FOREIGN INSTITUTIONS*

Applications, required records, and scores on the Test of English as a F
Language (see below) should be received from international students n
than March 1 (February 1 for some graduate programs) for the fall semest
October 1 for the spring semester.

### Required Records

At the time the application is sent, students must have the educ
institutions previously attended send directly to the appropriate adm
office (see Undergraduate Admission, pages 19–20, or Graduate Adm
pages 23–24) copies of official certificates and records listing subjects s
grades received, examinations taken, and degrees received. Certified co
diplomas and certificates from all secondary schools, colleges, and univ
attended are required. Records of state examinations and certificates

* For detailed admission requirements, see the appropriate college or school in this Bulletin

required. These records become the property of the University and cannot be returned.

These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies sent should be accompanied by a certified English translation.

### Language Tests

Students whose native language is not English are required to take the Test of English as a Foreign Language (TOEFL). Students are responsible for making arrangements to take the test by addressing inquiries to TOEFL, CN 6151, Princeton, N.J. 08541–6151. The completed registration form must be returned well in advance of the semester for which admission is sought. On the application for the TOEFL, students should specify that the scores are to be sent to the appropriate admissions office at this University. Registration for the TOEFL does not constitute application for admission to George Washington University.

Admitted students whose native language is not English are also required to take an English as a Foreign Language placement test prior to registering at the University. Depending on the results of this test, the student's academic program may be restricted in number and type of courses that can be taken. College credit is not granted for English study below the level of standard freshman English courses.

### Financial Certificate

A Financial Certificate must be completed and submitted with the application for admission of all international students planning to study at the University under the authorization of either a student (F) or exchange visitor (J) visa. Satisfactory completion and submission of the Financial Certificate is required for the issuance of a Form I-20 or IAP-66.

## TRANSFER WITHIN THE UNIVERSITY

For information concerning transfer from one college, school, or division to another within the University, see page 47.

## REGISTRATION

The dates, hours, and place of registration will be stated in the *Schedule of Classes*, which is available in advance of each semester.

Registration in on-campus courses is open only to those persons formally admitted to the University by the appropriate admitting office, as well as those students in good standing who are continuing in an approved program of study. No registration is accepted for less than a semester or one summer session.

Students may not register concurrently in this University and another institution without the prior permission of the dean of the college, school, or division in which registered in this University. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned, *prior to registration*. Registration is not complete until all financial obligations have been met.

**Eligibility for Registration**

Registration for the following categories of campus students is held on the day
of registration stated in the University Calendar and published in the Schedu
of Classes. A student who is suspended or whose record is not clear for an
reason is not eligible to register. Registration in a given course may be denie
students in the Division of Continuing Education when space is needed f
degree candidates.

*New Student*—Upon receipt of a letter of admission, the new student
eligible for registration on the stated days of registration.

*Readmitted Student*—A student previously registered in the University wh
was not registered on campus during the preceding semester must apply f
and be granted readmission by the appropriate admitting office before he or s
is eligible for registration.

*Continuing Student*—A student registered on campus in the immediate
preceding semester or the summer session preceding the fall semester
eligible to register assuming good standing and enrollment in a continui
program.

**Completion of Registration**

Registration is not complete until financial obligations have been fulfill
Attendance in class is not permitted until registration has been completed.

**Program Adjustment (Add/Drop)**

The program adjustment period begins the first day of classes. Program adju
ment requires the approval of the advisor, department, and dean concerne

**Registration for Consortium Courses**

Degree students interested in taking courses at any of the other institutio
in the Consortium of Universities of the Washington Metropolitan Area, I
(see page 51), should consult the program announcements of the other inst
tions. Consortium registration forms and instructions may be picked up in
Office of the Registrar. In order to participate in the Consortium progr
students must obtain the approval of an advisor and should ascertain f
the department of the institution where the course is taught whether they
eligible for the course and whether there is space in the class. Specific inqui
should be addressed to the Registrar.

## ES AND FINANCIAL REGULATIONS

s paid by students cover only a portion of the cost of the operation of the iversity. Income from endowment funds, grants, and gifts from alumni and nds of the institution makes up the difference.

he following fees and financial regulations were adopted for the 1988 mmer sessions and the academic year 1988–89.

### tion Fees

undergraduate and graduate study in Columbian College of Arts and Sciences, the duate School of Arts and Sciences, the School of Education and Human Development, School of Government and Business Administration, the School of International irs, and the Division of Continuing Education:

| | |
|---|---|
| campus program, each semester hour, to a maximum of $4,785 per semester | $358.00 |
| campus program (except Crystal City), each semester hour | 241.00 |
| rystal City Education Center, each semester hour | 260.00 |
| mmer Sessions, each semester hour | 291.00 |

ayment of tuition for a master's thesis entitles the candidate, during the period of stration, to the advice and direction of the member of the faculty under whom the is is to be written. In case a thesis is unfinished, additional semester hours may be ired in accordance with the regulations of the school in which the student is stered.

udents entering the doctoral program in the School of Government and Business inistration in 1988–89 will be charged $24,315 for the entire degree program, to be in 10 semiannual installments.

**vin Center Fee** (charged all students registered on campus)
semester hour, to a maximum of $100.50 per semester ..... 9.50

**itional Course Fees**—In certain courses additional fees, such as laboratory and rial fees, are charged by semester as indicated in the course descriptions. If breakage pparatus is in excess of the normal amount provided for in the laboratory fee, the ent will be required to pay such additional charges as are determined by the rtment concerned.

**puter Usage Fees** (charged for courses that use the computer facilities of the ersity)– Applicable fees are listed in the *Schedule of Classes* for each semester. The mum computer usage fee is $100 for any semester.

**dence Hall Fees** (see page 58)

### ial Fees and Deposits

| | |
|---|---|
| ication fee (undergraduate degree candidate), nonrefundable | 30.00 |
| lication fee (graduate degree candidate), nonrefundable | 25.00 |
| nce tuition deposit, nonrefundable, charged each entering or readmitted -time undergraduate student | 100.00 |
| ing deposit, nonrefundable, charged each applicant for residence hall ice | 300.00 |
| ission tests (when required) | 15.00 |
| registration fee, for failure to register within the designated period arged on-campus students only): | |
| ring first week of classes | 25.00 |
| ring second and third weeks of classes | 50.00 |
| er third week of classes (if permitted) | 100.00 |
| payment fee (see Payment of Fees, below) | 15.00 |
| mpus financial reinstatement fee, for reinstatement after financial en-nbrance for nonpayment of fees (see Payment of Fees, below) | 35.00 |

Off-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below) .....
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason .....
Binding master's thesis .....
Microfilm service and printing announcement of final examination (doctoral candidates) .....
Special Columbian College of Arts and Sciences departmental examination to qualify for receiving credit (advanced standing), waiver of requirement, or both .....
Waiver examination to qualify for advanced placement .....
English test for international students (when required) .....
Laboratory check-out fee, for failure to check out of chemistry laboratory by the deadline date set by the instructor (a student who drops a chemistry course before the end of the semester must check out of the laboratory at the next laboratory period) .....
Charles E. Smith Center fee (for off-campus degree candidates only): Students registered as degree candidates in a program offered through the Division of Continuing Education may purchase, on a semester-by-semester basis, a special card entitling them to use the Smith Center facilities for that semester or session. Students must first obtain from the Division a signed certificate attesting to degree candidacy .....
Statement issued by the Department of Romance Languages and Literatures certifying the degree of oral and/or written fluency and command of the French, Italian, Portuguese, or Spanish languages .....
Transcript fee .....
Replacement of lost or stolen picture identification card .....

Registration for on-campus courses in the University entitles each stud the following University privileges: (1) the use of the University Library; services of the Career Services Center; (3) gymnasium privileges; (4) adm to all athletic contests, unless otherwise specified; (5) the *Hatchet*, the s newspaper; (6) medical attention as described under Student Health S These privileges terminate when the student withdraws or is dismisse the University.

### Postdoctoral Study

Those who have graduated from George Washington University with a Ed.D., D.Sc., D.B.A., or D.P.A. may continue any studies in the Uni without payment of tuition (contingent upon the availability of space) a enjoy all University library privileges. Such graduates are required t nominal fee based on the prevailing credit hour rate for one semester h well as the University Center fee, in order to establish their active mem in the University. The use of laboratory space and equipment is con upon availability, and the cost of all laboratory or special library ma paid by the graduate. Special arrangements for such privileges must b with the dean two months in advance of the semester in which the g wishes to register. Postdoctoral work taken under this privilege may taken for credit.

### Payment of Fees

No student is permitted to complete registration or attend classes charges are paid or until arrangements for payment have been made. and fees for each semester are due and payable in full at the Offic Cashier at the time of each registration. Checks should be made pa George Washington University, with the student identification numb upper left corner.

he Student Accounts Office has responsibility for billing and maintaining dent accounts for tuition, various fees, and room and board charges. A dent registered for six semester hours or more may sign a deferred payment tract with the Student Accounts Office at the time of each registration, nitting payment of one-half of the total tuition and fees (except for fees able in advance) at the time of registration and the remaining half on or re Wednesday of the eighth week of classes for the fall and spring esters. Interest at the rate of 8 percent per annum on the unpaid balance be charged from the date of registration to the date payment is made. A 10-th payment plan is also available.

udents receiving tuition assistance in the form of scholarships, government on contracts, or other forms of tuition awards are not permitted to sign rred payment contracts unless the total tuition and fee charges exceed the e of the tuition awards by $2,000 or more. Under such circumstances the ent may be permitted to pay one-half of the amount due at the time of tration and to defer the balance by signing a deferred payment contract.

udents who fail to make any payment when due will be automatically ged a $15 late-payment fee and will be subject to the interest charge of 8 ent per annum. Accounts that become 30 days past due will be financially mbered. In the event a student's account is financially encumbered, the ent forfeits rights to the use of deferred payment contracts in future sters, and the Student Accounts Office will notify the Registrar to hold grades, future registration privileges, transcripts, diplomas, and other emic information until the account is settled. In addition, applications for tutional and federal financial aid cannot be processed until all encum-ces, including those for unpaid emergency loans, have been paid. Finan-ettlement will require payment in full of all amounts due to the University dition to a financial reinstatement fee of $35 for on-campus students and or off-campus students. Accounts that must be referred to a collection ce will be assessed all collection costs, including fees charged by the ction agency.

dents auditing courses are subject to all fees charged to students regis-for credit.

**urned Check Policy**—A student whose check is returned unpaid by the for any reason will be charged a returned check fee. If the check is not within 15 days, the student's account will be financially encumbered, he same restrictions and penalties as for late payment enumerated above.

**-Year Prepaid Tuition Plan**—Undergraduate students paying the set upper of tuition may receive a discount for the spring semester if payment is for the full academic year at the time of fall registration. At the 1988–89 tudents choosing this plan would pay $9,474 for two semesters instead of 0.

**r-Year Prepaid Tuition Plan**—New undergraduate students may elect to n advance the total tuition for their full four-year program at the rate able to their first year. A payment under this plan for programs beginning he 1988 fall semester would total $38,280. Refunds to students who do mplete their full four-year programs would be made at the original rate remaining full semesters.

**U Monthly Payment Plan**—The University's Monthly Payment Plan is ble to all students. Upon receipt of the appropriate application, the rsity will establish an account and mail payment coupons and envelopes e to ensure proper credit of payments. The plan covers an academic year ding summer sessions) and requires ten monthly payments, May through

February. Payments must be received by the 10th of each month. If a decisi
made after May to use this plan, all missed payments must be made to brin
account current to the time participation is initiated. There is no charge an
interest for using the plan if all payments are made as scheduled.

**Commercial Prepaid and Deferred Payment Plans**—Several commercial
grams for parents who wish to pay for college on a monthly basis are a
able. Terms and conditions vary, but most provide a life insurance poli
the contract. For specific details and applications, address inquiries t
following:

Mellon Bank Edu-Check Plan, P.O. Box 8888, Wilmington, Del. 19899
Richard C. Knight Insured Tuition Plan, 53 Beacon Street, Boston, Mass. 0
School-Chex, Irving Trust Company, 61 Broadway, New York, N.Y. 1000
Educational Loan Program, The Riggs National Bank, 1913 Massachusetts
N.W., Washington, D.C. 20035
The Tuition Plan, Inc., Concord, N.H. 03301
Tuition Line, Maryland National Bank, Consumer Banking Division, P.O
1954, Baltimore, Md. 21203

### Off-Campus Courses

Fees for each semester are due and payable in full at the time of
registration; however, a student registering for a 13-week or longer
course may sign a deferred payment contract at each registration to
payments in three equal installments—one-third at the time of registr
one-third by October 3, and one-third by November 3 (for the fall seme
one-third at the time of registration, one-third by February 7, and one-th
March 6 (for the spring semester). Payments are due at the stipulated
Interest at the rate of 8 percent per annum on the unpaid balance w
charged from the beginning of each semester to the date payment is ma

Students receiving partial government tuition assistance, employee be
and partial scholarships must pay their portion of the tuition in full at th
of registration.

Except for specified special sessions, tuition and fees for credit c
lasting less than 13 weeks and for all noncredit courses are payable in
registration.

### Withdrawals and Refunds*

Applications for withdrawal from the University or for change in
schedule must be made in person or in writing to the dean of the
school, or division in which the student is registered. Notification
instructor is not an acceptable notice (see Withdrawal, page 46). Financ
recipients must notify the Office of Student Financial Aid in writing.

In authorized withdrawals and changes in schedule, cancellations of
ter tuition charges and fees will be made in accordance with the fol
schedule for the fall and spring semesters:

1. *Complete withdrawal from all courses (on-campus students):*
   Withdrawal dated on or before Friday of the first week of classes .....
   Withdrawal dated on or before Friday of the third week of classes .....
   Withdrawal dated on or before Friday of the fifth week of classes .....
   Withdrawal dated after the fifth week of classes .....
2. *Partial withdrawal*: If the change in program results in a lower
   charge, the refund schedule above applies to the difference.

* No refund of the $100 tuition deposit required of entering students is granted

egulations governing student withdrawals as they relate to residence hall
d food service charges are contained in the specific lease arrangements.
ummer Sessions: In cases of authorized withdrawals from courses, refunds
75% of tuition and fees will be made for courses dropped within the first
ven calendar days following the scheduled registration day. No refund
ll be made for courses dropped thereafter.
efund Schedule for Off-Campus Registration:
ng Session (or any session longer than 13 weeks)

| | |
|---|---|
| Starting date of class plus 6 calendar days | 90% |
| Starting date of class plus 20 calendar days | 75% |
| Starting date of class plus 34 calendar days | 50% |
| Starting date of class plus 35 calendar days to end | None |

termediate Session (9 weeks, 1 day per week)

| | |
|---|---|
| Starting date of class plus 6 calendar days | 90% |
| Starting date of class plus 13 calendar days | 75% |
| Starting date of class plus 20 calendar days | 50% |
| Starting date of class plus 21 calendar days to end | None |

ort Session (7 weeks, 2 days per week)

| | |
|---|---|
| Starting date of class plus 2 calendar days | 90% |
| Starting date of class plus 8 calendar days | 75% |
| Starting date of class plus 15 calendar days | 50% |
| Starting date of class plus 16 calendar days to end | None |

ni Session (3 weeks)

| | |
|---|---|
| Starting date of class plus 1 calendar day | 90% |
| Starting date of class plus 5 calendar days | 75% |
| Starting date of class plus 9 calendar days | 50% |
| Starting date of class plus 10 calendar days to end | None |

refund will be made for sessions of less than 21 days.

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und policies of the University are in conformity with guidelines for
ds as adopted by the American Council on Education. Federal regulations
e that financial aid recipients use such refunds to repay financial aid
ed for that semester's attendance. This policy applies to institutional aid
ll.

o case will tuition be reduced or refunded because of absence from
s.

horization to withdraw and certification for work done will not be given a
t who does not have a clear financial record.
dents are encouraged to provide their own cash funds until they can make
g arrangements in the community.

## NCIAL AID

e Washington University offers a program of financial assistance for
graduate and graduate students. Undergraduate aid consists of two basic
awards for academic achievement without reference to financial circum-
s (honor scholarships) and scholarships, grants, loans, and employment
on academic achievement and demonstrated financial need. The pro-
of financial assistance for graduate students includes assistantships,
ships, traineeships, graduate scholarships, research appointments, part-
mployment, and loans. All undergraduate gift aid (institutional scholar-

ships and grants and federal grants) requires that the student be working o
first undergraduate degree. Undergraduate gift aid and all federal aid re
that the recipient be registered for a full-time course load at GWU. Loans
resident assistantships not based on financial need are available to underg
ates and graduates alike. In general, consideration for financial aid is rest
to students in good academic standing who meet the minimum grade
average for particular awards and are not financially encumbered by any
University office. Applications for institutional or federal aid cann
processed if the relevant tax returns have not been filed in accordance wi
IRS Code. Documents submitted as part of aid applications becom
property of the University and cannot be returned. Federal regulations r
that the University report suspected cases of fraud or misrepresentation
appropriate federal, state, and local authorities.

Information on the various programs follows.

## SCHOLARSHIPS AND OTHER FORMS OF AID FOR UNDERGRADUA

*Honor Scholarships*—George Washington University honor scholarsh
up to half-tuition for the academic year, based entirely upon aca
achievement and potential without regard to financial need, are restric
incoming freshmen.

*Need-Based Aid*—The University offers extensive programs of scholar
grants, loans, and employment based upon demonstrated need. The Univ
participates in the Perkins Loan Program, Pell Grant, Supplemental Educ
al Opportunity Grant, and the College Work-Study programs.

Applications and supporting credentials for financial aid must be fil
March 1 (all undergraduate students) preceding the academic year of the
for the fall semester; by November 1 for the spring semester; and by Apri
the summer sessions.* A student must reapply for all financial aid, incl
scholarships, each year; renewal is contingent upon funds being ava
when the student completes the application.

Complete information concerning financial assistance is contained i
student financial aid pamphlet, which is available at the Office of S
Financial Aid, George Washington University, Washington, D.C. 20052

The following scholarships are available to students in Columbian Co
Arts and Sciences, the School of Education and Human Developme
School of Government and Business Administration, and the Sch
International Affairs.

*The George Washington University Board of Trustees Scholarships*
and partial-tuition scholarships begin in the fall semester and may be re
through the senior year, provided the holder reapplies by the pub
deadlines, maintains a B average, and continues to be in financia
Candidates must plan to select a curriculum leading to a bachelor's de
any school listed above.

### Other Scholarships

Achievement Rewards for College Scientists (ARCS) Foundation, Inc.,
Scholarship
Sherman Page Allen Memorial Scholarship Fund (1966)

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* Only students who are enrolled in this University for at least 6 semester hou
immediately preceding spring semester or who have applied for financial aid for the
fall semester are eligible for consideration for summer sessions financial aid, pro
they will graduate at the end of that summer or the following fall semester or are re
their program to attend the summer sessions.

mni Scholarships
y J. Anderson Scholarship (1969)
and J.D. Antonelli Scholarship Fund (1987)
letic Scholarship Fund (1979)
on Andrews Scholarship (1920)
ry N. Brawner, Jr., Foundation Scholarship Fund (1963)
Britt Scholarship Fund (1984)
e M. Carper Undergraduate Scholarship Fund (1987)
na K. Carr Scholarships (1932)
ia M. Carter Scholarship (1871)
E. Casassa Memorial Foundation Scholarship (1968)
es Edward Miller Chapman Educational Foundation Scholarship (1984)
Chesapeake and Potomac Telephone Company Scholarship (1978)
mbian Women Scholarship Funds
ctoria Briggs Scholarship Fund (1959)
izabeth V. Brown Scholarship Fund (1925)
race Ross Chamberlin Scholarship Fund 1932)
llege Women's Scholarship Fund (1926)
lumbian Women Members' Scholarship Fund (1961)
rline Hughes Dufour Scholarship Fund (1961)
. Watson W. Eldridge, Jr., and John F. Eldridge Scholarship Fund (1964)
unders of Columbian Women Scholarship Fund (1920)
ss Lees Hardy Foundation Scholarship Fund (1957)
llian Young Herron Scholarship Fund (1925)
llie Maynard Knapp Scholarship Fund (1915)
arcia B. Kraft Scholarship Fund (1966)
net McWilliams Scholarship Fund (1954)
arie-Louise Ralph Turner Scholarship Fund (1963)
and John H. Davis Scholarship (1987)
Davis Scholarship (1869)
rict of Columbia Daughters of the American Revolution Scholarship (1952)
rict of Columbia Institute of Certified Public Accountants Scholarship in
ccounting (1964)
lla Constance Drane Scholarship (1957)
ent J. DeAngelis Scholarship Fund (1983)
rt Farnham Scholarship (1871)
eral Government Accountants Association—Washington, D.C., Chapter—
holarship in Accounting
er Brigham Fisher Scholarship (1951)
ge Washington University Tennis Alumni Association Scholarship (1974)
C. and Leslie Granoff Scholarship Fund (1986)
red Green Memorial Scholarship Fund (1959)
iron Foundation of the Gridiron Club Scholarship (1975)
re and Bertha Gudelsky Family Scholarship (1978)
a Spicker Hampel Scholarship (1949)
Lewis Harvey Scholarship (1921)
lton Scholarship (1950)
ge F. Henigan Scholarships in Debate (1967)
adai Scholarship Fund (1983)
rt A. and Esther C. Jones Scholarship Fund (1981)
n M. Jones Scholarship Fund (1981)
d B. and James L. Karrick, Jr., Scholarship Fund (1968)
uel and Elizabeth Kay Scholarships (1969)

Amos Kendall Scholarship (1869)
L. Poe Leggette Memorial Scholarship Established by WRGW (1968)
Thaddeus A. and Mary Jean Lindner Scholarship Fund (1985)
Calvin D. Linton Endowment Scholarship Fund (1987)
Mary and Daniel Loughran Scholarship (1976)
Barry Manilow Endowed Music Scholarship (1984)
Martha's Marathon Residence Hall Scholarship (1969)
Maud E. McPherson Scholarship in English and American Literature (19
A. Morehouse Scholarship (1861)
E. K. Morris Education Fund Scholarships (1972)
Helen Marie and Thomas E. Orr Scholarships (1965)
Henry and Caroline Orth Scholarship Fund (1985)
Pan-Dodecanesian Association of America Scholarship (1979)
Hardy Pearce Scholarship Fund (1972)
Phi Delta Gamma Scholarships (1956)
Fred B. and Alma D. Pletcher Scholarship Fund (1968)
Levin M. Powell Scholarships (1886)
Research Assistantships in Operations Research and Related Fields
Resident Assistantships
Jack B. Sacks Foundation, Inc., Scholarship (1983)
Henry Whitefield Samson Scholarship Fund (1966)
Lula M. Shepard Scholarships (1946)
Mildred Shott Scholarship Fund (1981)
Sigma Delta Chi Foundation of Washington, D.C., Scholarships
Myrna Sislen Guitar Scholarship (1983)
Margaret Lucille Snoddy Scholarship (1970)
David Spencer Scholarship (1918)
George Steiner Scholarship in Music (1985)
Mary Lowell Stone Scholarship (1893)
Charles Clinton Swisher Scholarships (1941)
U.S. Office of Education Traineeships (1964)
University Players Scholarship in Memory of L. Poe Leggette (1968)
William Walker Scholarship (1824)
Abigail Ann Brown and Henry Kirk White Scholarship Fund (1963)
John Withington Scholarship (1830)
Women's Physical Education Alumnae Association Scholarship (1964)
William G. Woodford Scholarship (1969)
Ellen Woodhull Scholarship (1919)
Zonta Club Scholarship (1950)
Barbara Jackman Zuckert Scholarship Fund for Blind Part-Time St
(1985)

**Grants**

*The GWU Grant Program*—Established for needy students who achieved a C or better average at GWU.

*Other Grants*—The following funds have been established to m special needs of disadvantaged students from the District of Columbi city and the Washington metropolitan area.

George Washington University's Educational Opportunity Program Grants (1968)
Key Club of Walt Whitman High School, Bethesda, Md., Grant (1968)
Marriott Foundation Grant (1968)

## ISTANTSHIPS, FELLOWSHIPS, AND OTHER FORMS OF AID R GRADUATE STUDENTS

lication and correspondence concerning assistantships, fellowships, train-ips, or graduate scholarships should be sent directly to the dean of the ol concerned and addressed to George Washington University, Washing- D.C. 20052. Unless otherwise specified, application and supporting lentials should be submitted no later than February 1 preceding the lemic year for which the award is made. Application for admission to uate study is a prerequisite for consideration.

### stantships

*esearch Assistantships*—Available in the fields of computer science, eco-ics, operations research, psychology, sociology, and statistics through the duate School of Arts and Sciences and its participation in sponsored grams with the Consortium of Universities of the Washington Metropolitan a.

*raduate Teaching Assistantships*—Available to graduate students in mas- and doctoral programs in most departments of the University. A graduate hing assistant receives financial compensation for a designated unit of ice to the assistant's major department of instruction.

*her Assistantships*—
lth Services Administration Research Assistantships
onal League of Cities/George Washington University Assistantship
n Affairs Assistantship

### wships, Internships, Traineeships, Special Programs

following fellowships, internships, and traineeships are available to ents in the Graduate School of Arts and Sciences, the School of Education Human Development, the School of Government and Business Administra- and the School of International Affairs. The University also offers many r fellowships that are available to students in these colleges and schools.

*iversity Fellowships*—Available to graduate students in master's and oral programs in most departments of the University. Fellowships are d on scholarship and each fellow may receive a stipend and/or tuition vance.

*search Traineeships*—Available under numerous sponsored programs in a ber of departments. Currently, the basic medical science departments and Departments of Psychology and Speech and Hearing offer such programs. nds vary; information is available from the departments.

*her Fellowships, Internships, Traineeships, and Special Programs*—
levement Rewards for College Scientists (ARCS) Foundation, Inc., llowship
rt A. Aleshire Fellowship Fund (1971)
rican Association of Collegiate Schools of Business Fellowship
rican Civilization Fellowships
rican Civilization Internships (Smithsonian Institution–George Washing-n University Cooperative Program)
rican Iron and Steel Institute Fellowship
ur Anderson & Co. Doctoral Fellowship
mehr Research Fellowships
Atlantic Graduate Fellowship (1987)
ield Scott Blaney Fellowship in International Affairs (1961)

Oliver T. Carr, Sr., Memorial Fellowship in Urban and Regional Planning
Thomas Alva Edison Fellowship
Elementary Teacher Education Internships
Ernst & Ernst Grant to Doctoral Candidates in Business or Economics
Health Services Administration Fellowships
Richard D. Irwin Doctoral Fellowships
Marvin L. Kay Fellowship in Finance (1986)
Rita H. Keller Scholarship Fund (1981)
Isabella Osborn King Research Fellowships (1927)
Loula D. Lasker Fellowships in Housing, City Planning, or Urban Renew
George McCandlish Fellowship in American Literature (1980)
Mellon Foundation Fellowships
Minorities in Planning and Related Professions Program
National Association of Purchasing Management Fellowship
National Historical Publications Commission–George Washington Unive
Cooperative Research Fellowships
National Science Foundation Graduate Fellowships
Resources for the Future, Inc., Fellowship Prize
Rose Bibliography Internships
Thomas Bradford Sanders Fellowships (1928)
Scottish Rite Foundation Fellowships
U.S. Office of Education Fellowships (1964)
U.S. Public Health Service Traineeships
U.S. Public Health Service Traineeships in Comprehensive Health Plann
Urban Studies Fellowships of the Department of Housing and Urban Development
Urban Transportation Center Fellowship
Ronald Barbour Weintraub Research Fellowship in Biological Sciences (

**Graduate Scholarships**

Armed Forces Health Professions Scholarship Program (The Uniformed vices Health Professions Revitalization Act of 1972—Public Law 92–4
William C. Barbee Scholarship in Sculpture (1975)
Emma K. Carr Scholarships (1932)
Oliver T. Carr, Jr., Scholarship in Urban and Regional Development (19
James Edward Miller Chapman Educational Foundation Scholarship (19
District of Columbia Institute of Certified Public Accountants Scholarsh Accounting (1964)
Genetics Graduate Scholarship (1979)
Frederick H. Gibbs Scholarship in Health Services Administration (196
Leo and Lillian Goodwin Endowment Scholarship (1986)
Hyundai Scholarship Fund (1983)
Albert A. and Esther C. Jones Scholarship Fund (1981)
Allen M. Jones Scholarship Fund (1975)
Mary and Daniel Loughran Graduate Scholarship (1976)
Foster G. McGaw Scholarship in Health Services Administration (1971
Paul Pearson Scholarship Fund (1940)
Phi Delta Gamma Scholarship Fund (1968)
Mildred Shott Scholarship Fund (1981)
Voorhees Scholarships
Wolcott Foundation Scholarships
Helen and Sergius Yacobson Graduate Scholarship (1987)

### ısored Awards for Graduate Study

rmation regarding awards sponsored by foundations, professional and ıed societies, industries, and others that may be used in support of uate study is available at the Gelman Library, 2130 H St., N.W., first floor. rmation is also available on distinguished programs, such as the Rhodes, shall, National Science Foundation, Fulbright, and Luce, as well as many rs.

## MS OF AID AVAILABLE TO UNDERGRADUATE GRADUATE STUDENTS

### stantships

*search Assistantships in Operations Research and Related Fields*—Avail- to graduates, and to undergraduates on the junior and senior levels, in any ol of the University. Research assistants are expected to work 20 hours a k, conducting research in support of an established research program, ramming, or conducting individual research on an approved research ct. Stipends range up to $10,000, depending on the status of the student the tenure of the appointment (9–12 months). Further information and ications are available from Director, Institute for Management Science and neering, School of Engineering and Applied Science, George Washington versity, Washington, D.C. 20052.

*sident Assistantships (men and women)*—Available to graduate students seniors in any field of study who are interested in working with the student onnel program in University residence halls. Specific duties vary with the tion, but basically consist of counseling, advising student groups, and inistration. Remuneration includes partial tuition and a furnished room for academic year. All positions are part time, and staff members are required roll as full-time students in degree programs. Further information may be ned from the Office of the Director of Housing and Residence Life.

### Funds

following loan funds are available to undergraduate and/or graduate ents in Columbian College of Arts and Sciences, the Graduate School of and Sciences, the School of Education and Human Development, the ol of Government and Business Administration, and the School of national Affairs. A separate application must be submitted for all loan rams. Applications for the Perkins Loan Program should be filed no later March 1 (all undergraduates) or April 1 (graduate students) for the wing academic year. Complete information is contained in the student ncial aid pamphlet, which is available from the Office of Student Financial George Washington University, Washington, D.C. 20052.

rican Medical Association Nursing Home Administration Loan Fund
ge F. Henigan Loan Fund (1975)
national Student Loan Fund (1967)
ne Jacobs Student Loan Fund (1974)
. Kellogg Foundation Hospital Administration Loan Fund
e B. Martin Loan Fund (1967)
ins Loan Program
n Miller Stout Memorial Loan Fund (1973)
ersity Student Emergency Loan Fund
Edmund W. Dreyfuss Loan Fund (1983)
Peter and Doris Firsht Loan Fund (1983)

*Guaranteed Student Loan Program*—George Washington University is eligible participant in the Guaranteed Student Loan Program. Freshmen sophomores may apply for a maximum of $2,625 per year; juniors and seni a maximum of $4,000 per year. Graduate students may apply for a maximu $7,500 per year. Students who intend to use the loan for payment of tuitio registration should submit an application, as well as all required suppor documents, no later than June 1 (fall semester registration), October 1 (sp semester registration), or March 1 (summer registration).

*Parent Loan for Undergraduate Students*—George Washington Universi also an eligible participant in the Parent Loan for Undergraduate Stud Program (PLUS) and the Supplemental Loans for Students (SLS). The inte rate on the loans is variable, based on the interest rate on U.S. Treasury bill a maximum of 12%. Repayment begins 60 days after the disbursement o check. Parents of dependent undergraduate and graduate students may a for up to $4,000 per year for each student. Independent undergraduate graduate students may apply for up to $4,000 per year on their own be Students who intend to use the loan for payment of tuition at registra should submit an application no later than June 1 (fall semester registrat October 1 (spring semester registration), or March 1 (summer registration

*The CONSERN Loan Program*, jointly sponsored by the District of Colu and the Consortium of Universities of the Washington Metropolitan A provides supplementary aid to creditworthy students and parents who financial need remaining after having exhausted benefits from all other fe state, and institutional aid programs for which they qualify (except C PLUS/SLS, and HEAL). Applicants must be enrolled at least half time and demonstrate financial need otherwise unmet. CONSERN loans range $2,000 to $12,000 per academic year and carry a variable interest rate, ini 9%.

### Student Employment

The University participates in the College Work-Study Program. Inq should be addressed to the Office of Student Financial Aid. In addition Career Services Center maintains a registry of both full-time and part positions available in the Washington area for undergraduate and gra students.

After registration, students may apply at the Career Services Cent interviews and referrals to positions for which they are qualified.

## INTERNATIONAL STUDENTS

Undergraduate international students with proven financial need who completed one semester of full-time work (15 hours) at this University wi average are eligible to apply for the Board of Trustees Scholarships; those a C average are eligible to apply for GWU Grants. Aid is awarded in the for the following academic year. See instructions for applying for under ate financial aid, above.

Limited awards for graduate teaching assistantships and University f ships are the responsibility of the chairman of the department or dean school in which the degree is to be earned.

International students applying for graduate teaching assistantships have minimum scores of 570 on the Test of English as a Foreign Language listening comprehension) and 250 on the Test of Spoken English. Interna students applying from outside the University may be appointed to gra teaching assistantships but must attend a five-day orientation and eval

m held the week prior to registration. Those found to have difficulties nglish will be required to enroll in specified courses in English as a n Language (tuition fees for these courses will be waived) and will be ed nonteaching duties in place of classroom instruction. Such students reevaluated each semester; if they are not designated as qualified to give om instruction by the end of one academic year, the teaching assistant- ill be withdrawn.

luate students who are presently enrolled at GWU and have been ed as candidates for graduate teaching assistantships by their depart- must pass the Test of English as a Foreign Language at the levels ed above and will be required to complete successfully the English for tional Students oral interview and the orientation and evaluation n before they will be considered for graduate teaching assistantships. urther information on requirements for international teaching assistants, the office of the Assistant Vice President for Academic Affairs, Rice fth floor, George Washington University, Washington, D.C. 20052.

-term loan funds for undergraduate and graduate international students ited in amount and are available only to those foreign-born persons who stablished resident status in the United States through the Immigration turalization Service.

suggest that students who wish to study in the United States have le sufficient funds to cover expenses for one full year before attempting r a college or university. The cost at this University for one academic eptember–May) is approximately $15,100. This estimate includes room ard, tuition, books, clothes, and incidental expenses; no travel, holiday, ical expenses are included.

## ANS BENEFITS

terans Benefits office, located on the third floor of Rice Hall, 2121 Eye W., assists students entitled to educational benefits as active-duty nel, veterans, or as widows or children of deceased or totally disabled s with any problems that may arise concerning their benefits. This office rocesses certification of enrollment and attendance to the Veterans istration so that educational allowances will be paid.

n feasible, students entitled to benefits as active-duty personnel, veter- dependents of veterans should consult with the veterans counselor prior nitting application to the Veterans Administration. All such students obtain the instruction sheet issued by the veterans counselor, which th requirements to be fulfilled before certification of enrollment can be o the Veterans Administration and that includes other information of interest.

Veterans Administration is at 941 N. Capitol St., N.E., Washington, 421.

## S

*untancy Prizes*—Three prizes for academic excellence awarded annual- ne Department of Accountancy—one at the undergraduate level, one at ster of Accountancy level, and one at the Master of Taxation level.

*beth B. Adams Prize*—Awarded annually by the Department of Manage- cience to a graduating student for outstanding performance in the field

of information systems management. The recipient is selected on the be scholarship, leadership within the Department, contributions to the Univ and service to the community.

*Morris M. Aein Memorial Prize*—Awarded to a deserving student for lence in drawing.

*Alpha Chi Sigma Prize*—Awarded annually by the Alpha Pi Chapter student who has attained the highest academic record in courses in chem The name and year of graduation of the student is inscribed on a bronze p The winner must have had at least 16 hours in chemistry, including th semester at this University.

*American Chemical Society Prize*—Awarded to an undergraduate s who has completed the junior year and who has demonstrated excelle analytic chemistry.

*American Institute of Certified Planners Outstanding Student Prize*—A ed to a qualified candidate for the Master of Urban and Regional Plannin has demonstrated significant service to the community, University and D ment, or professional planning community.

*American Institute of Chemists Prize*—A medal awarded annually graduating student majoring in chemistry who excels in scholarship, in and leadership.

*Amling Prize*—Established by Dr. Frederick Amling in honor of his p Gustav and Elsie Amling, for the best investment report in Business Ad tration 123, Investment and Portfolio Management.

*Department of Art Prizes*—Two prizes—one for a senior in art histo one for a senior in the fine arts—awarded annually to the most pro students, as determined by the departmental faculty.

*William C. Barbee Prize*—Awarded to a deserving student for excell sculpture and sculptural ceramics.

*Perry Botwin Prize*—Awarded annually to an outstanding senior program in special education of the School of Education and Development.

*The Walter G. Bryte, Jr., Achievement Award*—Provided by Walter G Jr., Colonel, U.S. Air Force (retired), first Professor of Air Science at Washington University. The award is presented annually primarily undergraduate residence hall, secondarily to any other activity at the sity, that has shown, under the leadership of its elected or designated h most improvement or excellence in its support of the principles and aim United States of America and George Washington University. The hall activity will be awarded a cash prize, and the name of its leader and the activity will be engraved on a silver trophy.

*Buka Family Prize*—Provided by Ruth Buka in honor of her parent and Rosa Buka, and her sister, Hilde Buka-Lacour. It is awarded to t outstanding student in the Department of Germanic Languages and Lite

*Sylvia L. Bunting Prize*—Awarded annually to a graduate student in of biology or zoology.

*Byrne Thurtell Burns Memorial Prize*—Awarded to the senior ma chemistry who shows the greatest proficiency in organic chemistry denced by a comprehensive examination, and who possesses suc fications of mind, character, and personality as to give promise o achievement.

*Business Administration Prize*—Awarded annually by the Depart Business Administration to the outstanding graduating senior in administration on the basis of scholarship, leadership and servic University.

*Vilbur J. Carr Prize*—Established in 1962 by Edith K. Carr, former Trustee of University, in memory of her distinguished husband, who was graduated n the School of Comparative Jurisprudence and Diplomacy in 1899. It is rded annually to that student in the graduating class of the University who demonstrated outstanding ability in the study of international affairs and has given evidence of possessing in marked degree the qualities that duce the good citizen and the dedicated public servant.

*hemical Rubber Company Freshman Chemistry Achievement Prize*—*A dbook of Chemistry and Physics* awarded annually to the freshman student has demonstrated the greatest achievement in Chemistry 15–16.

*hemical Society of Washington Prize*—Awarded to an outstanding under- uate in the junior year who is majoring in Chemistry.

*stere E. Claeyssens Prize*—Established in 1981 by the Trustees of the Bess Arthur Dick Family Foundation. It is awarded for the best original work in writing by a student enrolled in the University.

*rome Cornfield Memorial Prize*—Awarded annually to the student who has ten the best Ph.D. dissertation in the Department of Statistics.

*ertice Cornish Prize*—Awarded annually to an outstanding student com- ng a graduate program in special education.

*hn Henry Cowles Prizes*—Two prizes, established by John H. Cowles, d Commander of the Supreme Council of Thirty-third Degree (Mother ncil of the World) of the Ancient and Accepted Scottish Rite of Free- onry, Southern Jurisdiction of the United States of America. Awarded upon uation to the graduate or undergraduate student with the best overall lastic achievement and leadership potential in the School of Government Business Administration and in the School of International Affairs.

*Witt Clinton Croissant Prize*—Awarded annually to the undergraduate ent enrolled in a course in drama or active in University dramatics who nits to the English Department the best essay on drama or the theater.

*K. Cutter Prize*—Established by Marion Kendall Cutter "for excellence in tudy of English." Awarded to the member of the graduating class whose rd in English, combined with general excellence, shows most marked ude for and attainment in English studies.

*ac Davis Prizes*—Established in 1847 and awarded annually to the three rs who have made the greatest progress in public speaking while enrolled e University. Awards are determined by a public-speaking contest in h the participants deliver original orations. Only members of the senior of Columbian College of Arts and Sciences who are candidates for the ee of Bachelor of Arts or Bachelor of Science are eligible to compete.

*nry Grattan Doyle Memorial Prize*—Established in memory of Henry an Doyle, a former Dean of Columbian College. Awarded annually to an anding senior for excellence in Spanish.

*on Prize*—Established by the Reverend Romeo Elton, of Exeter, England, awarded annually to the student with the highest average in the most nced course in the Greek language and literature.

*se Frederick Essary Prize in Journalism*—Established by Helen Essary hy and awarded annually to a student who has given promise of sound nship and who submits the best printed and published evidence of ability rthright reporting" and good journalistic writing in a student publication ewhere.

*sie Fant Evans Prize*—A bequest of Joshua Evans, Jr., in 1971, in recogni- of his wife's distinguished record at and service to the University, on e Board of Trustees she served as the first woman member. Awarded ally to an outstanding senior student in a contemporary history course.

*Joshua Evans III Prize in Political and Social Science*—A memorial pr
"established by friends because of an outstanding life." Awarded annually
that student in the graduating class "who has demonstrated his/her sig
ability in the social and political sciences and who has given promise of
interpretation of that ability in good citizenship among his/her fellows."

*Willie E. Fitch Prize*—Established by James E. Fitch in memory of his
Awarded annually to a senior student for the best examination in chemist

*Charles E. Gauss Prize*—Established in honor of Charles E. Gauss, El
Professor of Philosophy from 1945 to 1964. Awarded annually to a gradua
senior for excellence in philosophy.

*Alice Douglas Goddard Prize*—A memorial established by Frederick Jos
Goddard, of Washington, D.C. Awarded annually to the senior student mak
the highest average in American literature.

*Edward Carrington Goddard Prize*—Established by Mary Williamson G
dard, Alice Douglas Goddard, and Frederick Joseph Goddard, of Washing
D.C., in memory of Edward Carrington Goddard, class of 1881. Awarded to
junior or senior student making the highest average in the French language
literature.

*Morgan Richardson Goddard Prize*—A memorial established by Mary
liamson Goddard, Alice Douglas Goddard, and Frederick Joseph Goddard
Washington, D.C. Awarded to the junior or senior student making the hig
average in the following fields: business administration, economics, inte
tional business, or public accounting.

*Harmon Choral Prize*—Awarded annually for significant musical acc
plishment and outstanding contribution to the choral program.

*Ching-Yao Hsieh Prize*—Two prizes awarded annually, one to an under
uate and one to a graduate student in the Department of Economics.

*Gardiner G. Hubbard Memorial Prize in United States History*—Establi
by Gertrude M. Hubbard in memory of her husband and awarded annual
that member of the graduating class majoring in history who has mainta
the highest standing in courses in United States history.

*Human Services Program Prize*—Awarded by the Department of Educ
to a graduating senior in the Human Services Program who best exemplifie
attributes of service to the profession and academic achievement wh
student at the University.

*Cecille R. Hunt Prize*—Offered annually to deserving art students and
two or three years to participants in the University's Art Alumni Exhibit

*International Business Prize*—Two prizes awarded annually by the Sch
Government and Business Administration to students specializing in in
tional business, one awarded to a graduating senior and one awarded
graduate student.

*Elmer Louis Kayser Prize*—Established by Paul and Elizabeth Rutheiser
awarded annually by the Department of History for the best thesis in hi
submitted by a candidate for the degree of Master of Arts.

*David Lloyd Kreeger prizes in Art*—Eight prizes given by Mr. Kreeger,
the fine arts and two in art history (including museology). Fine arts priz
awarded to a senior or graduate student in painting, sculpture, printma
ceramics, photography, and visual communication. One prize in art hist
awarded to a senior and one to a graduate student. Candidates for the
must submit original papers or works of art. Winners are selected by
guished representatives of the field of art in the Washington, D.C., area.

*Minna Mirin Kullback Memorial Prize*—Established in 1968 by Sol
Kullback in memory of his wife. Awarded annually by a committee of
members of the Department of Statistics to a full-time undergradu

ate student majoring in statistics, who will have completed 18 semester
of statistics courses by the end of the spring semester.

n Francis Latimer Prize in Classics—Established in 1973. Awarded to a
ating senior who has made the most outstanding record as a major in the
tment of Classics.

da Haves Manchester Prize in Sociology—Established in honor of Hilda
Manchester, B.A. 1932, an outstanding student whose major field was
ogy. Awarded annually by Columbian College of Arts and Sciences to the
student majoring in sociology who has the highest scholastic record.

ian Nellis Memorial Prize—Awarded to a student in the English Depart-
who has shown special promise in the field of creative writing.

Delta Kappa Prize—Awarded annually by the George Washington
rsity Chapter to an outstanding senior in a teacher education program in
hool of Education and Human Development.

Delta Kappa Research Prize—Awarded annually by the George Washing-
niversity Chapter to a graduate student, for an outstanding research
t.

Eta Sigma Prize—A choice book selected from the field of the recipient's
awarded annually by the George Washington University Chapter to the
t attaining the highest scholastic average in the first full semester of
The winner's name is engraved on a plaque in the Office of the Dean of
bian College of Arts and Sciences.

ambda Theta Prize—Awarded annually by Alpha Theta Chapter to an
nding senior in a teacher education program in the School of Education
uman Development.

Chi Prizes—Two prizes awarded annually by the George Washington
rsity Chapter to the best undergraduate student in experimental psychol-
d to the M.A. degree candidate or second-year graduate student submit-
e best thesis or research project in psychology.

lic Administration Prize—Awarded by the Department of Public Admin-
n to the outstanding graduating student in public administration on the
f scholarship, leadership, and service to the University.

s Trust Award—Established by Francis J. Lyons, Vice-Chairman of the
Riggs National Bank, for the best graduate research paper in Business
istration 223, Investment Analysis and Portfolio Management.

gles Prize—Established by Professor William Ruggles in 1859, awarded
ly to a candidate for a bachelor's degree for excellence in mathematics.

Jack and Anne Ryan Award in Health Services Administration—
ed annually to that Health Services Administration student who dis-
xcellence of analysis and writing skills in the preparation of a paper on a
n health services administration.

nann and Johanna Richter Schoenfeld Prize—Established in grateful
iation of the inspired teaching and devotion to his students of Dr.
nn Schoenfeld, who for more than 20 years until his death in 1926
the Department of German. Hermann Schoenfeld, Ph.D., LL.D., was
recognized as a scholar of distinction whose presence on the faculty
prestige to the University. This prize is given annually to a member of
duating class for excellence in historical and cultural phases of German
.

ol of International Affairs Alumni Association Prize—May be awarded
ly to a graduate of the School of International Affairs (graduate or
raduate degree recipient) who, in the opinion of the Dean and the
, deserves recognition for academic achievement and contribution to
of the George Washington University and its programs and goals.

*Julian H. Singman Prizes*—Two prizes awarded annually, one in desig
one in aquarelle painting.

*Walton E. Smith Memorial Prize*—Awarded annually by the Departme
Management Science to a graduating student for outstanding performan
the field of information systems technology. The award is given to a st
who has demonstrated exceptional performance on the comprehensive e
nation, in course work, and in contributions to the program by other me

*Society of Colonial Wars in the District of Columbia Prize*—A cash
awarded to a candidate for a graduate degree who, in the judgment o
faculty of the Department of History, submits a thesis or dissertation de
strating excellence in historical research in American Colonial history
University reserves the right to withhold the award if no thesis or disser
attaining the required degree of excellence is submitted.

*Staughton Prize*—Established by the Reverend Romeo Elton and aw
annually to the student making the best record in the most advanced cou
the Latin language and literature.

*Alfred E. Steck Memorial Prize*—Awarded for proven excellence in th
of sculpture.

*James MacBride Sterrett, Jr., Prize*—Established in 1911 by Professor S
in memory of his son. Awarded annually to the student who obtains the h
average in Physics 1 and 2.

*Charles Clinton Swisher Historical Club Prize*—Established in 1936
Charles Clinton Swisher Historical Club and augmented in 1941 by the b
of Professor Swisher. Awarded annually to the student who submits th
essay covering some phase of medieval history.

*James H. Taylor Graduate Mathematics Prize*—Established in mem
James H. Taylor, former Professor of Mathematics at the University. Aw
annually to a graduate student for outstanding performance in mathem

*Geza Teleki Prize*—Awarded for outstanding work in the geological sc

*Patricia M. Toel Memorial Prize*—Awarded annually to a graduate stu
photography to recognize outstanding achievement.

*Benjamin D. Van Evera Memorial Prize*—Awarded annually to that G
Teaching Fellow in Chemistry selected as the most effective teacher dur
current academic year.

*The Wall Street Journal Leadership Prize*—Awarded annually to a gra
senior with a major field of study in finance within the Bachelor of B
Administration degree, for outstanding academic performance and ser
the University.

*Thomas F. Walsh Prize*—Established in 1901 and awarded annually
student who submits the best essay in Irish history.

*Elizabeth Reed Ward Award*—Established by the finance faculty
Business Administration Department in honor and memory of Elizabe
Ward, who was a teaching assistant in finance. The award is to be ma
outstanding teaching assistant in the finance program.

*Alexander Wilbourne Weddell Prize*—Established in 1923 by Virgin
Weddell in memory of her husband. Awarded annually to a degree ca
who writes the best essay on "the promotion of peace among the natio
world." The prize essays shall become the property of the University
not be printed or published without the written consent of the Univers
University reserves the right to withhold the award if no essay attai
required degree of excellence is submitted.

*W.T. Woodson Prize*—Awarded annually to a graduate student de
ing outstanding achievement in educational administration in the S
Education and Human Development.

## ULATIONS

ents enrolled in the University are required to conform to the following ations and to comply with the rules and regulations of the college, school, vision in which registered.

udents who withdraw or are suspended, or who, for any other reason, are egistered at the University for one semester or more, may re-enter and nue work only under the regulations and requirements in force at the time urn.

student knowingly makes a false statement or conceals material informa- on an application for admission, registration form, or any other University ment, the student's registration may be canceled. If such falsification is vered after the student has matriculated at the University, the student may bject to dismissal from the University. Such a student will be ineligible pt by special action of the faculty) for subsequent registration in the ersity.

## DENT STATUS

ne purpose of defining student status, undergraduates taking 12 or more ster hours and graduates taking 9 or more semester hours are considered to ll-time students. All other students are considered to be part time.

## ENDANCE

nts may attend only those classes for which they are registered. Regular dance is expected. Students may be dropped from any course for undue ce.

## OLARSHIP REQUIREMENTS

nts who fail to maintain the scholarship requirements of the college, l, or division in which registered may be dismissed from the University.

## s

s are mailed to students through the Office of the Registrar at the close of semester. They are not given out by instructors or released over the one.

### RGRADUATE

llowing grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, ass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, horized Withdrawal; *P*, Pass; *NP*, No Pass. Other grades that may be ed are *A*−, *B*+, *B*−, *C*+, *C*−, *D*+, and *D*−. Except for courses that ically state that repetition for credit is permitted, a candidate for a degree University may not repeat a course in which a grade of *D* or better was ed, unless required to do so by the department concerned. A written ent, indicating that the student is required to repeat the course, must be tted to the student's dean by the appropriate department chairman.

### ATE

llowing grading system is used: *A*, Excellent; *B*, Good; *C*, Minimum Pass; edit; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, horized Withdrawal. Except for courses that specifically state that ion for credit is permitted, a candidate for a degree at this University may

not repeat a course in which a grade of C or above was received, unless req
to do so by the department concerned. A written statement to this effect mu
submitted to the student's dean by the appropriate department chairman

INCOMPLETE/AUTHORIZED WITHDRAWAL

When another grade has not been assigned, the symbol *I* (Incomplete)
symbol *W* (Authorized Withdrawal), or the symbol *Z* (Unauthorized Withd
al) will be recorded. The symbol *I* indicates that a satisfactory explanatio
been given the instructor for the student's inability to complete the req
work of the course. At the option of the instructor, the grade of *I* ma
recorded if a student, for reasons beyond the student's control, is unab
complete the work of the course, and if the instructor is informed of
approves, such reasons before the date when grades must be reported.
grade may be used only if the student's prior performance and class attend
in the course have been satisfactory. Any failure to complete the work
course that is not satisfactorily explained to the instructor before the date
grades must be turned in will be graded *F*. If acceptable reasons are
presented to the instructor, that instructor may initiate an appropriate
change. The grade of *Z* is assigned when students are registered for a c
that they have not attended and in which they have done no substantial g
work.

CHANGING A GRADE OF INCOMPLETE

For information concerning changing a grade of Incomplete, consu
regulations of the college, school, or division concerned.

THE QUALITY-POINT INDEX

Scholarship is computed in terms of the quality-point index, obtain
dividing the number of quality points by the number of semester hou
which the student has registered, both based on his or her record i
University. Quality points are computed from grades as follows: *A*, 4.0
3.7; *B+*, 3.3; *B*, 3.0; *B−*, 2.7; *C+*, 2.3; *C*, 2.0; *C−*, 1.7; *D+*, 1.3; *D*, 1.0; *D−*,
for each semester hour for which the student has registered. Courses m
*CR*, *I*, *IP*, *P*, *NP*, *W*, or *Z* are not considered in determining the index, exce
courses marked *I* will be considered when a final grade is recorded. Wi
exception of Consortium courses, grades in courses taken at other insti
are not considered in computing the quality-point index.

**Final Examinations**

Final examinations for undergraduate courses are scheduled by the O
the Registrar. Examinations for courses numbered 201 or above are sche
if desired, by the individual department or instructor.

**Academic Dishonesty**

The University community, in order to fulfill its purposes, must establi
maintain guidelines of academic behavior. All members of the commu
expected to exhibit honesty and competence in their academic work. In
students have a special responsibility to acquaint themselves with, an
use of, all proper procedures for doing research, writing papers, and
examinations.

Members of the community will be presumed to be familiar with the
academic procedures and held responsible for applying them. De
failure to act in accordance with such procedures will be considered a

honesty. Acts of academic dishonesty are a legal, moral, and intellectual ense against the community and will be prosecuted through the proper iversity channels.

Copies of the University policy on academic dishonesty can be obtained from following officers: all department chairmen, all academic deans, the gistrar, and the Vice President for Academic Affairs.

## UDENT CONDUCT

students, upon enrolling and while attending The George Washington versity, are subject to the provisions of the *Statement of Student Rights and ponsibilities*, which outlines student freedoms and responsibilities of duct, the Judicial System for Nonacademic Student Discipline, and other cies and regulations as adopted and promulgated by appropriate University horities. Copies of these documents may be obtained at the Office of the Vice sident for Student Affairs. Sanctions for violation of these regulations may ude permanent expulsion from the University, which may make enroll- t in another college or university difficult. Regulations or requirements licable only to a particular program, facility, or class of students may not be lished generally, but such regulations or requirements shall be published in anner reasonably calculated to inform affected students.

## THDRAWAL

hdrawal from a course or from the University requires the permission of the n of the college, school, or division in which the student is registered. A le of *W* will be recorded on the student's academic record. Permission to ndraw from the University will not be granted a student who does not have ear financial record (see Payment of Fees).

ach college, school, and division of the University sets deadline dates for semester concerning withdrawal. Withdrawal between these dates and the of the semester is permitted only in exceptional circumstances.

ll charges for courses from which the student withdraws are subject to the nd policy listed under Fees and Financial Regulations. Unauthorized ndrawal will result in the recording of a grade of *Z* for the course or courses.

## ANGES IN PROGRAM OF STUDY

*hanges Within a College, School, or Division*—A student may not substitute course for another, drop courses (see Withdrawal, above), or change status credit to audit or from audit to credit without the approval of the dean of college, school, or division in which registered.

hange from one section to another of the same course may be made with the roval of the dean and the department concerned.

hange from one major field to another within the same college or school be made with the approval of the dean.

*ansfer Within the University*—Application for transfer to another college, ol, or division must be made to the appropriate admitting office on the provided by the office concerned.

ith the exception of the School of Government and Business Administra- which limits a student to 15 semester hours earned in nonmatriculated s, a maximum of 45 semester hours earned in the Division of Continuing cation may be applied toward a bachelor's degree in the other degree- ting colleges or schools of the University.

udents transferring within the University are advised to study carefully the irements listed below under Graduation Requirements and to note that

unless otherwise specified, in all undergraduate divisions, 30 semester h
including at least 12 semester hours in the major field, must be compl
while registered in the school or college from which the degree is sought. U
transfer the student should consult the dean concerned and understand cl
the requirements that must be fulfilled.

## CREDIT

Credit is given only after completion of registration in a course and
factory completion of the required work, or upon the assignment of adva
standing in accordance with the regulations of the college, school, or div
concerned.

*Auditing*—A person who has been admitted to the University ma
registered, with the permission of the instructor, as an auditor in a clas
academic credit). An auditor is not required to take active part or to
examinations. A student who takes a course as an auditor may not repeat it
for credit. Tuition is charged at the prevailing rate.

## POST-ADMISSION TRANSFER CREDIT

Students who plan to attend another institution and apply credit so e
toward graduation from this University must first secure the written app
of their dean. In no event will credit in excess of what might be earned
similar period in this University be recognized.

## TRANSCRIPTS OF RECORD

Official transcripts of student records are issued on written request
student or former student who has paid all charges, including any studen
installments, due the University at the time of the request. A fee of
charged for each transcript. Partial transcripts are not issued.

## CONTINUOUS ENROLLMENT

Once entered in a degree program, a student is expected to be contin
enrolled and actively engaged in fulfilling the requirements for the degre
semester of the academic year until such time as the degree is con
Should the student break continuous enrollment at the University a
request and be granted a leave of absence (see below) or be assigned by th
to inactive status (see below), he or she must apply for readmission
granted, be subject to the requirements and regulations then in force.

## LEAVE OF ABSENCE

Should a degree student find it necessary to interrupt active pursuit
degree, he or she may petition the dean for a leave of absence for a
period of time, generally limited to one calendar year. A degree stude
discontinues active enrollment in degree studies without being granted
of absence, or a student granted a leave who does not return to active s
the close of the period of approved absence, must apply for readmission
subject to the regulations and requirements then in force. No fees are a
students while on leave of absence. The right to use of University facil
suspended while the leave is in effect.

## INACTIVE STATUS

Under the regulations established by each school and college, a student
considered in continuous pursuit of the degree while not enrolled in co
the University when engaged in the following: cooperative engineering

ester; study abroad program; attendance at another institution with prior roval to have work transferred back to the GWU program; completion of standing work in courses in which a grade of Incomplete was received; or -course instructional activities unique to the particular school or college. tudents must request to be enrolled in inactive status, in advance of the year emester concerned, and be granted approval by their dean for the specific vity desired. This status is generally limited to one year; no fees are ssed students while in this status.

## ADUATION REQUIREMENTS

rees are conferred in February, May, and September.
o be recommended by the faculty for graduation a student must have met admission requirements of the college or school in which registered; pleted satisfactorily the scholarship, curriculum, residence, and other irements for the degree for which registered; filed an application for uation prior to the published deadline date; and be free from all indebted- to the University. Enrollment is required for the semester or summer ion at the close of which the degree is to be conferred.
*pplication for Graduation*—An Application for Graduation form must be at the time of registration for the last semester or summer session of the or or final year. Students completing degree requirements during the mer sessions will be awarded diplomas (no formal convocation) dated ember 30, *provided* they have completed all degree requirements and have ied for graduation as a part of registration for the summer sessions.
*holarship*—The student must meet the scholarship requirements for the cular degree for which registered.
*rriculum*—Minimum curriculum requirements for each degree are stated r the college or school offering work in preparation for the degree.
*sidence*—Unless otherwise specified, in all undergraduate divisions of the ersity, a minimum of 30 semester hours, including at least 12 hours in the r field, must be completed while registered in the school or college from h the degree is sought. This requirement applies to students transferring n the University as well as to students transferring from other institutions. ss special permission is granted by the dean of the college or school erned to pursue work elsewhere, the work of the senior or final year must mpleted in the college or school from which the degree is sought.
e graduate student must meet the residence requirements for the particular e for which registered.
*esis or Dissertation*—A thesis or dissertation submitted in partial fulfill- of requirements for a degree must be presented in its final form to the of the college or school concerned no later than the date specified in the ersity Calendar.
cepted theses and dissertations, with accompanying drawings, become the rty of the University and are deposited in the University's Gelman y, where the duplicate copies are bound and made available for circula- See the appropriate college or school in this *Bulletin* for regulations ning theses and dissertations.

## ORS

lor's degrees with honors are awarded to students whose academic ls give evidence of particular merit. The student's quality-point index nines the level of honors as follows: *cum laude*, 3.4–3.59; *magna cum* 3.6–3.79; *summa cum laude*, 3.8–4.0.

The quality-point index is calculated by the Office of the Registrar, and honors designation is entered on the transcript and diploma of those stud who earn an honors designation. To be eligible, a student must comple least 60 hours of course work at GWU.

SPECIAL HONORS

Special Honors may be awarded by the faculty to any member of the gradu class for outstanding achievement in the student's major field on recomme tion of the major department. The student must fulfill all of the follo requirements:

1. Candidacy for Special Honors must be approved by the faculty me representing the major department or field not later than the beginning senior year.
2. Such other conditions as may be set at the time the candidacy is app must be met.
3. At least one-half of the courses required for the degree must have completed at GWU.
4. The specific requirement of the college or school in which registered be fulfilled as follows: (a) Columbian College of Arts and Sciences or the S of International Affairs—grades of A or B in 50 percent of the courses ta GWU; (b) the School of Education and Human Development or the Sch Government and Business Administration—a quality-point index of at le on all course work taken at GWU.

## THE LIBRARY

All students registered in the University have the privilege of usi University's Gelman Library. Its stacks are open, and all students are w to browse. A card denoting approved enrollment for the current semest be presented when books are borrowed for outside use.

The loan period for stack books is 21 days. Any book that circulates is to recall by the library if needed for reserve or other use. Reserve books used in the reserve reading room when the library is open, except that th be withdrawn for overnight use beginning at 8:30 p.m. Transcripts of gr withheld until a student's library record is clear, with all borrowe returned and any fines paid.

All students using the University's Gelman Library are expecte familiar with its detailed regulations, available at any of the library's desks.

## RIGHT TO DISMISS STUDENTS

The right is reserved by the University to dismiss or exclude any stud the University, or from any class or classes, whenever, in the intere student or the University, the University Administration deems it ad

## RIGHT TO CHANGE RULES

The University and its college, schools, and divisions reserve the modify or change requirements, rules, and fees. Such regulations sha force whenever the proper authorities may determine.

## RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in program notice whenever circumstances warrant such changes.

## VERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

Family Educational Rights and Privacy Act of 1974 applies to institutional cies governing access to and release of student education records main-ed by educational institutions that are recipients of federal funds. The versity complies with this statute, which states, in part, that such institu-s must

afford students access to education records directly related to them;

offer students an opportunity for a hearing to challenge such records as curate, misleading, or otherwise inappropriate;

receive students' written consent before releasing information from their ation records to persons outside the University, except as provided by the nd except for directory information as indicated below (information may rnished to a student's parents without such written consent only upon fication of the student's financial dependency); and

comply with a judicial order or lawfully issued subpoena to release a nt's record, notifying the student of this action.

e University will release the following directory information upon re-: name, local address, and telephone number; name and address of next of dates of attendance; school, college, or division of enrollment; field of ; credit hours earned; degrees earned; honors received; participation in izations and activities chartered or otherwise established by the Univer-including intercollegiate athletics); and height, weight, and age of mem-of athletic teams. A student who does not wish such directory information sed must file written notice to this effect in the Office of the Registrar at the ning of each semester or session of enrollment.

pies of the University's full policy statement on the release of student mation may be obtained from the Office of the Registrar.

## PERTY RESPONSIBILITY

University is not responsible for the loss of personal property. A Lost and d Office is maintained on campus in the Safety and Security Office.

## VERSITY POLICY ON DRUGS

niversity cannot condone violations of law, including violation of those hat proscribe possession, use, sale, or distribution of drugs. Members of ademic community should know that administrative action, which may le dismissal from the residence halls, revocation of other privileges, or nsion or dismissal from the University, may be taken in order to protect terests of the University and the rights of others.

# OCIATIONS AND SERVICES

## ORTIUM OF UNIVERSITIES OF THE WASHINGTON OPOLITAN AREA, INC.

universities in the Washington area—American University, Catholic rsity of America, Gallaudet University, George Washington University, town University, Howard University, Marymount University, the Uni-of the District of Columbia, and the University of Maryland—are

associated in a Consortium through which they coordinate the use of
respective facilities; Mount Vernon College and Trinity College are asso
members of the Consortium. Students in approved programs leading to de
in any one of these institutions have the opportunity to select from
combined offerings the particular courses that best meet their needs.
privilege is subject to regulations of the school or division in which the st
is enrolled.

Participation is limited to degree candidates. The following, howeve
excluded: students in canon law, dentistry, medicine, nursing, and the
Law students are also excluded from participation, except for candidat
the degree of Master of Laws at George Washington University and George
University.

In special courses involving private instruction (such as music or
tutorial study, if a special fee is charged, this fee is not covered b
Consortium agreement and must be paid by the individual student
institution administering the course.

Students are encouraged to study the program announcements of all p
pating institutions. See Registration for information concerning registrati
Consortium courses.

Registration forms and instructions are available from the registrar
institution in which the student is enrolled. Students register and pay tuit
their own institutions for all Consortium courses; course fees are payable
visited institutions.

## THE READING CENTER

Director F.E. Hesser

The Reading Center offers individual diagnostic and corrective services
levels: primary, elementary, secondary, and adult. Special reading im
ment classes are conducted for high school and college students as w
other adults. There is also an After-School Program designed for acade
gifted children. Instruction is available on an individual, semi-individu
small-group basis.

A complete diagnosis includes psychological tests; vision, hearing,
nance, and spelling tests; and various types of reading achievem
aptitude tests. Results are interpreted, and a written report is presen
conference with the parents or the individual.

The special reading improvement classes for high school students,
students, and other adults are offered throughout the year at stated int
Emphasis is placed on improvement of vocabulary, speed, comprehensi
study skills. Instruction in spelling is also provided as needed.

*Fees*—Individuals should contact the Center regarding the fee sc
All fees are payable in advance at the Reading Center, Funger Hall, Su
2201 G St., N.W.

## THE SPEECH AND HEARING CENTER

The George Washington University Speech and Hearing Center p
diagnosis and treatment of a wide range of speech, language, and
disorders. These include developmental impairments of articulati
language, stuttering, voice disorders, and speech and language impa
resulting from neurological damage. Evaluation and aural rehabilitat
also provided for hearing-impaired individuals. The Speech and H
Center operates in conjunction with the Department of Speech and He

## WRITING CENTER

ctor Kim Moreland

Writing Center, located in 201A Stuart Hall, is a center for informal and onal writing instruction; its services are provided free to all GWU students. lents at all levels of experience and expertise are encouraged to use the er for help in identifying writing problems and learning how best to ess ideas. Trained tutors (undergraduate peer tutors, graduate students, the ctor, and other members of the faculty) work with students individually on s of specific need or interest. Tutors can provide assistance in such areas as nizing a mass of information efficiently and clearly, using correct grammar punctuation, getting started on a writing project, developing a thesis, iding evidence in support of an argument, and presenting the findings of xperiment or the solution to a research problem.

## VERSITY COMPUTER CENTER

ctor F. William Rambo

University Computer Center is located in the Academic Center, 801 22nd N.W. The Center is normally open 24 hours a day, seven days a week, ng the academic semesters; the user area may not be open nights during the er and summer breaks.

e Center provides computational facilities, consultation, and operational tance as required. It operates two IBM 4381 computers (VM/VS1/CMS). c terminals and dial-in lines are available for academic users. There is a ange of compilers and application software packages.

addition to the central facility, computer services and facilities are able in several of the schools; microcomputers are widely available as The University's GW Data Network ties together the mainframes and of the microcomputers, and the University computers are connected to ational computer networks BITNET and SURANET.

## PUTER INFORMATION AND RESOURCE CENTER

ger Donald E. Rickert

Computer Information and Resource Center/User Services (CIRC/US) is the ry source of information and consultation on the use of computers and uter networks at the University. CIRC/US publishes a periodic newsletter mputing issues, gives seminars, and offers technical advice to faculty and nts regarding access to and use of the IBM mainframe and microcom- s, the GW Data Network, and microcomputer selection and acquisition. US is responsible for distribution of a number of site-licensed micro- uter software packages and administers and can make recommendations rious discount-purchase programs for microcomputer equipment.

nputer programming courses are offered by the School of Government and ess Administration, the Department of Statistics/Computer and Informa- ystems, and the School of Engineering and Applied Science. In addition, other departments offer courses that utilize the computer as a research ct to course work.

University student may have access to the computer facilities for dual research, class projects, and thesis or dissertation study. Access is quest; the schedule of charges is available at CIRC/US in the Academic r.

## GW TELEVISION

*Assistant Vice President for Television* Ted J. Christensen

The main television resource of the University is GWTV, a state-of-the-art multichannel broadcast facility. Goals of GWTV are to develop courses programs in cooperation with academic departments for broadcast off ca to develop videotapes for class use and for continuing professional educ to expand a program of national and international teleconferences, a manage the acquisition and maintenance of television equipment and faci in various instructional units.

Operating from studios located in the Academic Center, GWTV ha capability to receive from and transmit to any communications satellite. teleconference programs are delivered to a number of on-campus loca such as studios, conference rooms, and auditoriums, where participant interact by telephone link with the originating site.

## ALUMNI RELATIONS OFFICE

*Director* Ronald W. Howard

The Alumni Relations Office, in conjunction with the General Alumni As tion, makes available to alumni and their families an annual progr services and educational and cultural events. The Office prepares both and Spring Schedule of Alumni Events, listing all activities; studen invited to participate in the programs held on campus. In addition, the Al Relations Office sponsors or co-sponsors programs and services des specifically for the student body.

Alumni are encouraged to inquire about available services and progr the Alumni Relations Office and to keep the Office informed of any cha address or occupation.

The Alumni Relations Office is located in Alumni House, 714 21st St.

## GENERAL ALUMNI ASSOCIATION

*President* John R. Manning

The objectives of this organization are to unite the graduates who w associate themselves for charitable, educational, literary, and scientif poses, and to promote the general welfare of the University.

Membership in the Association is conveyed automatically to anyone w been graduated from any school or division of the University. Anyone w earned 15 credit hours or the equivalent at the University, who has l University in good standing, and whose class has graduated is eligi membership; in the case of the Division of Continuing Education st however, only the "15 credit hours earned" requirement and not the " tion of the class" requirement applies. Graduates of CCEW certificate pr are also eligible.

A Governing Board, composed of members representing the co alumni of the University's schools and college, directs the activities Association. The voluntary leadership of the Association works close the staff of the Alumni Relations Office in carrying out Association affa Association may be contacted through the Alumni Relations Office.

## ROTC

George Washington University students may enroll through the Consor the Army ROTC program offered at Georgetown University, the A

n at the University of Maryland, or the Army ROTC or AFROTC at University. Those interested should contact the ROTC enrollment t one of these universities. Limited credit for such courses (primarily d ROTC) may be assigned for electives to meet degree requirements at Washington University; prior approval is required by the dean of the n which the student is enrolled.

Naval Science under Courses of Instruction for the NROTC program at Washington University.

## NT LIFE

*sident for Student Affairs* William Smith, Jr.

ice of the Vice President for Student Affairs develops student life , policies, and procedures to complement the University's formal ion program. These activities are implemented through the offices of yd Heck Marvin Center, Counseling Center, Dean of Students, Edu- Opportunity Program, Housing and Residence Life, International Services, Disabled Student Services, Student Activities, Career Ser- nter, and Student Health Service.

### OF THE DEAN OF STUDENTS

Students Gail Short Hanson
t Dean of Students Cheryl Beil
t Dean, *Educational Services* Linda Donnels
t to the Dean, *Judicial Affairs* Richard A. Weitzner

ce of the Dean of Students provides counseling and information for , administers the nonacademic student disciplinary system, and assists am development for the Division of Student Affairs. Staff members are rmed on University policies and the various student services provided us, enabling them to provide referrals and answers to many questions ng general student life. Personal letters of recommendation for stu- plying to graduate and professional schools can be obtained from this he Dean of Students is responsible for the services and programs y Judicial Affairs, the Counseling Center, Educational Opportunity , International Student Services, Disabled Student Services, Student ervice, and Career Services Center. The Dean of Students' office is n the fourth floor of Rice Hall.

#### ng Center

Diane M. DePalma

nseling Center fosters personal growth and development and helps als with personal, social, career, and study problems that interfere ir educational goals. University students, staff, and faculty are eligible ces. These include (1) short-term individual counseling, art therapy, ervention, and referral services for personal problems (e.g., academic s, relationship issues, family problems, concerns about sex, self- (2) group counseling for personal problems; (3) educational vocational ng and assessment to assist students in planning their majors and (4) workshops designed to facilitate students' learning about them- d developing new ways of interacting with others (e.g., assertiveness

training, stress management, relationship skills, and study skills semine
consultation with faculty, staff, and student groups about their special n
designing programs to improve the campus environment.

The Center administers the Miller Analogies Test, GWU admission
and special assessments for business and industry. Its Community Voc
Counseling Services provides career counseling and testing to GWU
and the greater Washington community.

Students, staff, and faculty may schedule a cost-free initial intervie
9 a.m. to 5 p.m., Monday through Thursday, and from 1 to 5 p.m on Frid
most services a modest fee per appointment is charged. An additional m
fee is charged for test batteries. Fee adjustments can be made if financial
a factor. Disabled students are asked to call ahead so that arrangements
made to adapt services or to meet at an accessible site. The Counseling C
located at 718 21st St., N.W.

**International Student Services**

*Director* E. Donald Driver
*Assistant Director* John Hartt
*Advisor* Ann Morton

International students, scholars, faculty, and staff are provided as
through International Student Services. The staff offers immigration as
and information on government requirements and regulations specifi
international community; orientation programs to help with adjust
living and studying in the United States; and advising and counseli
variety of personal problems, including cultural adjustment, living co
budgets, academic concerns, and financial aid. International Student
is located at 2129 G St., N.W.

**Educational Opportunity Program**

*Director* Valerie L. Epps
*Assistant Director* Donald L. Ross

The Educational Opportunity Program (EOP) provides selected D
Columbia students with financial aid, academic support services, and
advising to assist them in pursuing undergraduate work at George Wa
University. The EOP staff coordinates a precollege program as well a
tional and cultural activities to promote the success and enhance th
ence of program participants.

The EOP staff administers the High School/College Internship
(HI/SCIP), which enrolls highly motivated District of Columbia hig
seniors. Participants enroll at GWU as nondegree candidates, takin
mum of 6 credit hours per semester in addition to their high school cu
Application to the HI/SCIP program is made through the student's hi
guidance office. Counseling and advising is provided by the EOP staf
students have access to all of the academic support services availab
participants. The Educational Opportunity Program is located at 2
N.W., Room 101.

**Disabled Student Services**

*Assistant Dean, Educational Services* Linda Donnels
*Coordinator* Christy Willis

The Disabled Student Services office works to assure that the specia
necessary for handicapped students to participate fully in their

grams and the extracurricular life of the campus are provided for them ough University or community resources. The office is located on the fourth r of Rice Hall.

**eer Services Center**

ector Kathy Sims
*istant Directors* Ken Everingham, Marva Gumbs

Career Services Center provides career planning and job-seeking assis-e to students and alumni. Programs and services include full-time and part-e job vacancy listings; career counseling; workshops (e.g., organizing job ches, resume and letter writing, effective interviewing, negotiating for ry); a resource library of career field and employer literature; on-campus rviews for students within one year of graduation; a resume referral service; me critiques; a call-in job listings service, Jobline; and a credentials service supports employment and graduate/professional school applications. The ter is located in the Academic Center, Suite T-509, 801 22nd St., N.W.

**ent Health Service**

ctor Isabel Kuperschmit, M.D.
*rdinator* Janet Garber, N.P.

Student Health Service is an outpatient clinic located at 908 New Hamp-e Ave., N.W., 7th floor. The Service is scheduled to move to the ground of the new Burns building extension in October 1988.
he Health Service is staffed by physicians, nurse practitioners, and physi-assistants who are capable of addressing most of students' medical lems. Visits are cost free and may be arranged by appointment or, during in hours, secured on a walk-in basis. Many routine lab tests may be rmed in the Health Service lab at cost; allergy shots, immunizations, and ous lab tests are done at little or no charge. Psychiatric evaluation, crisis rvention, and short-term therapy are available by appointment.
r serious emergencies occurring during hours when the Student Health ice is closed, students may go to the Emergency Room of the University pital for treatment. All fees are the responsibility of the student.
udents must be currently enrolled on campus in the University to receive ment at the Student Health Service. Students enrolled in off-campus rams and the Continuing Engineering Education Program are not eligible. bills incurred from all services rendered outside of the Student Health ice (for example, x-ray work, laboratory work, and office visits to private icians) are the responsibility of the student.

**TH AND ACCIDENT INSURANCE**

University has arranged for and endorsed group health and accident rance, on an elective basis, for all students. Interested students should act the Student Health Service or Office of the Dean of Students.

**SING AND RESIDENCE LIFE**

tor Ann Webster
*ciate Directors* David McElveen, Kathleen Jordan
*tant Directors* Rebecca Griffin, Mark Crowley

plete information concerning the University's residence halls is available the Director of Housing and Residence Life, George Washington Univer-

sity, Washington, D.C. 20052. Information concerning off-campus housing
the University may also be obtained at this office.

Admission to the University does not include a room reservation.
student will receive, with the notification of acceptance, University resid
hall information, an application for residence hall space or apartment acc
modation, and a declaration of intent to attend the University. The applica
for residence hall space or apartment accommodation must be accompanie
a $300 *nonrefundable deposit*. The housing deposit is credited toward the
semester's room or apartment charge. Rooms and apartments are leased fo
academic year, and lease payment must be made in early June for the
semester, unless the student elects the deferred payment plan or the 10-m
payment plan. Please check with Housing and Residence Life for the defe
payment plan and with Student Accounts for the 10-month payment pla

**1988–89 Residence Hall Rates per Person for Two Semesters***

| | |
|---|---|
| Calhoun Hall | |
| double room | |
| triple room | |
| Crawford Hall | |
| double room | |
| Everglades Hall | |
| triple room | |
| Guthridge Hall | 3,430 |
| apartment for one person | |
| apartment for two persons | |
| apartment for three persons | |
| Building JJ | |
| apartment for two persons | 2,920 |
| apartment for four persons | |
| apartment for six persons | |
| Francis Scott Key Hall | |
| apartment for one person | |
| apartment for two or three persons | |
| Madison Hall | |
| double room | |
| triple room | |
| Milton Hall* | |
| apartment for two persons | |
| apartment for three persons | |
| Mitchell Hall | |
| single room | |
| Munson Hall† | |
| apartment for two persons | |
| apartment for three persons | |
| Riverside Towers Hall‡ | 3,490 |
| apartment for one person | |
| apartment for two persons | |
| Strong Hall (for women only) | |
| single room | |
| double room | |
| triple room | |
| Thurston Hall | |
| double room, triple room, room for four or five | |

* Residence hall prices and allocation are subject to change.
† Residents must pay electricity bills (which do not include the cost of heating) in
the stated rate
‡ Rates include surcharge for HBO.

**ervice***

nt freshmen and sophomores are required to choose one of the following rvice plans: the any 14 meals per week plan for $2,150 for the academic ie any 10 meals per week plan at $2,090 for the academic year; or the any s per week plan at $2,030. Participation in the food service plans is l for junior, senior, and graduate students. Food service payment does ver University intersession or vacation periods. All meal cards admit to the dining room in Thurston Hall and to the second-floor contract room in the Cloyd Heck Marvin Center. A small percentage of the meal ay also be used on a cash basis in the Marvin Center first-floor cafeteria, s, and the Courtyard Cafe at Mitchell Hall.

ents who observe the Jewish dietary laws can write to make arrangements with the GW Housing and Residence Life Office regarding the B'nai Hillel Foundation Kosher Meal Plan.

## HECK MARVIN CENTER

r LeNorman J. Strong
nt Director Donald Cotter

oyd Heck Marvin Center is the campus community center, offering and recreational and social opportunities for students, faculty, staff, and campus guests. Its wide range of facilities includes an information dining services, offices to accommodate campus organizations, and nce and meeting rooms. The Center also provides the setting for a of programs conducted by the University Program Board, by the ic departments that include the performing arts, and by other student lty organizations.

Marvin Center Governing Board, representative of all segments of the ity community, plays an important role in the functioning of the Center ing closely with the Center's staff in the review and development of guidelines, and procedures that direct the operation of the Center.

## NT ACTIVITIES OFFICE

Claudia Derricotte
t Directors Michael Elmore, Ellen Fancher, Elizabeth Panyon

dent Activities Office assists individual students and organizations in development, campus leadership development, and participation in projects, within both the University community and the community at ie Office serves as a clearinghouse for activities information, registers ses student organizations, and informs the University community of s and programs through monthly and annual publications. The Student s Office is also responsible for coordinating the orientation program for dents and for planning supplemental development programs for and undergraduate students. Students who want to participate in the icular phases of University life should acquaint themselves with the and staff of the Student Activities Office.

onal information about the numerous student organizations and ees is contained in the *Student Handbook*, compiled by and available udent Activities Office in the Marvin Center.

vice prices are subject to change.

### Student Government

The George Washington University Student Association is comprise
full-time and part-time graduate, professional, and undergraduate s
who are registered for academic credit on campus. A body of elect
appointed individuals is responsible for representing the interests of s
at the University. The Student Association provides various servi
students, such as an academic evaluation, a student directory, and the
Advocate Service. Further information can be obtained from the
Association office in the Marvin Center.

Student involvement in the governance of the University is also
through participation in various administrative and Faculty Senate c
tees, advisory councils of the schools and colleges, selected committe
Board of Trustees, and specialized bodies, such as the Residence Hall
tion, the Joint Food Services Board, and the Marvin Center Governing
This involvement has helped develop policies and programs bene
students and to the total University community.

### Student Organizations

Students are encouraged to become involved with existing student o
tions or to initiate their own. There are approximately 200 registered
tions on campus covering a broad spectrum of interests, including a
professional, international, cultural, political, service, sports, hobbie
ational, religious, and meditative, as well as social fraternities and s
Academic honor societies include Phi Beta Kappa, Sigma Xi, and other
to specific academic disciplines.

## RELIGIOUS LIFE

The University recognizes the contribution that religion makes to the
students and encourages them to participate in the various religious
tions of their own choice. Several religious bodies sponsor various gr
form a link between the University and the religious community. The
of the religious organizations are available for counseling. Religious
and special observances are also provided for the University comm
announced.

## MAJOR PROGRAM EVENTS

*Art Exhibits*—The work of locally, nationally, and internationall
artists is shown in monthly exhibits in the Dimock Gallery in Lisner
um and in the art gallery of the Cloyd Heck Marvin Center. Student a
are presented each semester.

*Concert Series*—The Department of Music presents a series o
featuring faculty, guest, and student artists throughout each year.

*Dance*—The GWU Dance Company presents major concerts, inform
performances, experimental events, television appearances, and
demonstrations. Students may audition to become company member
the opportunity to choreograph, perform, and gain experience in the
aspects of dance productions.

*Glee Club, Jazz Band, and Orchestra*—The University Glee Club,
and Orchestra are available to students either as credit courses or as
lar activities. All of these organizations present major performan
University community several times a year, including regular
spring concerts.

*rnational Programs*—The International Student Society presents an l International Dinner in cooperation with foreign embassies and interna- restaurants. Other programs include regular forums and speakers on ational topics.

*gram Board*—The University Program Board, composed chiefly of elected ppointed students, is given primary responsibility and resources for t programming on campus. Through its various committees, and in ation with other campus groups, it regularly sponsors films, lectures, ts, social activities, and special events.

*ter*—The University Theater produces four or five major plays and ls during the year on the proscenium/thrust stage in the Dorothy Betts Theatre. Additional works, including original and experimental plays, duced in a more intimate studio theater. Students can participate in all of theater and may receive credit toward their B.A. or M.F.A. degrees e of their production work.

## TICS, INTRAMURAL SPORTS, AND RECREATION

arles E. Smith Center for Physical Education and Athletics offers many s for student use, including courts for basketball, volleyball, and ton; a jogging track; a swimming pool; wrestling, gymnastic, and weight handball and squash courts; and a sauna and lockers. Based in the Center, the men's and women's athletic departments offer a broad n of intramural and recreational activities designed to accommodate levels of skill, experience, and interest.

University is a member of the National Collegiate Athletic Association e Atlantic Ten Conference. Its varsity teams compete against major ities throughout the Midwest and Eastern Seaboard in such sports as all, baseball, soccer, tennis, golf, wrestling, crew, swimming and diving, badminton, volleyball, and gymnastics.

## DARY FIELDS OF STUDY

am of secondary fields of study has been established within the ty to provide opportunities for formal interschool study. Students enrolled in a degree program and must be in good academic standing to le to take a secondary field in another school. The secondary fields f 12 to 18 hours of prescribed courses, depending on the field, with hip requirements determined by the school offering the field. Upon ry completion of all requirements, the title of the secondary field of d the courses taken in support of the field are entered on the student's t. For further information, see the brochure *Secondary Fields of Study* in the offices of the deans or from the Vice President for Academic

## COLUMBIAN COLLEGE OF ARTS AND SCIENCES

*Dean* C.M. Lovett
*Associate Deans* J.J. Cordes, D. McAleavey
*Assistant Dean* N.K. Khatcheressian
*Director of Academic Advising* B.P. Selinsky

### FACULTY 1987–88

*Professors* E. Abravanel, J. Aschheim, D.L. Atkins, R.P. Bain (*Research*
Bari, J.R. Barth, W.H. Becker, O. Bergmann, B.L. Berman, L.S. Bowl
Brennan, R.G. Brown, J.F. Burks, E.A. Caress, A.J. Caron (*Research*),
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Lange, P. Langton, H.L. LeBlanc, D.R. Lehman, P.H.M. Lengerm
Levy, J.F. Lewis, R.K. Lewis, H.W. Lilliefors, C.A. Linden, R.C. Li
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Jr., J.N. Mosél, C.A. Moser, N.N. Natov, H.R. Nau, B. Nimer, R.K. P
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tors M.B. Bandas, P. Connerton, A.B. Covarrubias, C.J. Demnitz, Donaldson, Jr., P.N. Edmonson, M.E. Evans, C.L. Iacobelli, E.M. Murray, P. Saunders, S.M. Spolarich, N. Taghavi

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an of Columbian College is an *ex officio* member of all committees; all listed e members are elected by the Faculty of Columbian College.

## INTRODUCTION

Since its founding in 1821, Columbian College, the college of liberal sciences of George Washington University, has been the cornerstone dynamic campus community in the heart of the nation's capital. With facilities and a full-time faculty of about 300, the College offers students the advantages of a small liberal arts institution as well as opportunities for professional and pre-professional education in many fields internships and employment in a stimulating urban environment. The college's students come from all 50 states and from about 100 foreign co

The rich and diverse liberal arts and sciences curriculum is designed strengthen the student's ability to communicate, to reason, and to understand the social and physical environment. This purpose is accomplished the study of various disciplines—the humanities, the social sciences, mathematical and natural sciences. With this foundation, Columbian graduates are well prepared for a wide range of jobs or for more specialized professional and graduate education. The College offers programs leading degrees of Bachelor of Arts, Bachelor of Science, and Bachelor of Students may elect one of more than 50 departmental majors, or they may double majors, interdisciplinary majors, or individualized degree programs. Special curricular guidance is given to students planning to apply to medical or law school.

## ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the proposed studies contemplated are required.

Requirements for admission to the freshman class are as follows:

1. An acceptable certificate of graduation from an accredited secondary school, showing at least 15 units,* which must include four years of English, least two years of one foreign language; two years of science, preferably laboratory instruction; two years of social studies, one of which is American history; and one year of college-preparatory mathematics, including introductory algebra. Typically, at least a *B* average or equivalent is required.

2. The principal's statement that the applicant is prepared to undertake college work.

3. Standardized test scores submitted on College Board Achievement Tests in English composition and mathematics and on either the Scholastic Aptitude Test or the American College Testing battery.

4. Admission to the Bachelor of Music curriculum requires, in addition to the above, a performance audition (a tape is acceptable) and/or music

It is recommended that the College Board examinations be taken in December or January. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the College Board Admissions Testing Program, CN 6200, Princeton, N.J. 08541–6200, not less than one month before the date of the test. When applying for the test, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C.

American College Testing battery scores are also accepted. The applicant should request that these scores be sent to the Office of Admissions from the American College Testing Program, Iowa City, Iowa. It is recommended that the applicant take the tests in October of the senior year.

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* A unit represents a year's study in a secondary school subject, including in the less than 120 sixty-minute periods, or the equivalent, of prepared classroom work

Committee on Admission and Advanced Standing will consider the
acy of the qualifications of an applicant who, because of unusual
stances, does not present all of the formal requirements stated here. The
ittee may prescribe appropriate scholastic aptitude tests. Students ad-
with deficiencies in secondary school units will be required to begin
ing such deficiencies within the first year, by appropriate courses or
nations.

## LATIONS

missions; Registration; Fees and Financial Regulations; Regulations.

## ORY SYSTEM

tudent is provided with both academic advising and personal counsel-
cademic advising is performed by members of the faculty selected for
nowledge of academic programs, and each student, before registration,
up a program in consultation with the advisor assigned. A student who
selected a major field receives academic advising in the Office of the
Columbian College Student Services. Students must keep in close touch
heir advisors, whose office hours are posted in the Student Services
on area. A student who has officially declared a major field receives
ic advising from the appropriate department or from an interdepart-
committee. *Personal* counseling is available through the Office of the
Students or through the University Counseling Center.
cademic warning system directs early attention to students whose work
low required standards. In such cases, students are asked to consult
ly with their advisors. On request, and with the student's permission,
of academic warnings or probation notices may be sent to parents or
ns, who are themselves welcome to meet with members of the advisory

### vising

plement academic advising by faculty members in Columbian College,
dvising is also available during fall and spring registration and the
r Advance Registration Program. Undergraduate peer advisors, repre-
a broad range of major fields, are centrally located to offer scheduling
d course selection advice to fellow students. Peer advisors are available
ide assistance throughout the academic year. A directory of peer
is available from the Office of the Dean shortly after the beginning of
nester.

## ARSHIP REQUIREMENTS

### ic Work Load

urage academic performance of high quality, the College limits the
s work load.
-time student not on probation may take a course load of as much as 17
hours.
mount of work taken by a student on probation will be limited by the
ee on Scholarship.
-time student who, during the immediately preceding semester, has
no grades below B– and has earned grades of *A* or *A*– in three courses
at least 9 semester hours may take 18 or 19 hours.

A student who accepts employment after registration or at any time d
semester must immediately report that fact to the dean so that the ac
program may be adjusted, if necessary.

### Attendance

The student is held responsible for all the work of the course in
registered, and all absences must be excused by the instructor in charg
provision is made for the student to make up work missed.

### Classification of Students

A student becomes a *sophomore* upon completion of 30 semester
*junior* upon completion of 60 semester hours, and a *senior* upon comp
90 semester hours.

An *unclassified* student is one who is not a candidate for a bachelor'
(normally because the student already holds one) but who wishes fo
academic reason to take a limited program for a limited time. Registr
this status is permitted only with the prior approval of the Dean's Co

### Leave of Absence and Continuous Enrollment

Students in Columbian College who wish to interrupt their studies mu
to the dean for either Continuous Enrollment or Leave of Abse
Regulations, page 48). If approved, either form of inactive status ass
student that, for at least one semester, re-entrance to the College may ta
under regulations prevailing at the time of last registration. A student
apply for a second semester of either type of leave, but ordinarily such
only available for one calendar year. After two semesters of inactive st
student is expected to resume active study toward a degree.

All study at any other college or university, in this country or
undertaken by a continuing student must be approved by the dean in a

### Academic Standing

A student who is not suspended or on probation is considered to be
standing.

The following rules governing probation and suspension are appli
stated to students enrolled for a full-time program (12 semester hours
during the fall or spring semester. Students enrolled for less than 12
hours during the fall or spring semester and students enrolled du
summer sessions are subject to probation or suspension on the basis
cumulative record, a "semester" being considered a time interval in
least 12 semester hours have accrued.

*Probation*—A student whose cumulative quality-point index is less
(but 1.00 or more) after attempting a minimum of 24 semester hour
placed on probation. The course load of a student on probation sh
more than 13 semester hours. Probation will be removed if, after
second semester on probation, the student's quality-point index is
2.00 or more. A student still on probation after two semesters (or 24
hours attempted) ordinarily will be suspended but may be cons
probation by the Committee on Scholarship (see below).

*Suspension*—The following circumstances constitute grounds fo
sion: (1) a cumulative quality-point index below 1.00 after atte
minimum of 24 semester hours, and (2) failure to attain a cumulati
point index of 2.00 or more after two successive semesters (or 24
hours attempted) on probation. The Committee on Scholarship may

t on probation (in lieu of suspension) if satisfactory progress is demon-
during the probationary period and/or sufficient evidence of academic
se, by way of a statement of appeal, is offered by the student.
minimum period of academic suspension is one fall or one spring
er. Final dates for applying for readmission are the same as those
ing undergraduate admission (see Admissions). A suspended student
g readmission must submit evidence to the Committee on Scholarship of
ct during absence from the University that indicates that the student will
rom readmission. A student suspended twice for poor scholarship will
readmitted.

ester Warning—A student whose cumulative quality-point index is less
.00 after attempting a minimum of 12 semester hours will be issued a
g notice at the end of the semester by the Office of the Dean and shall be
y advised to take corrective measures (e.g., limitation of course load to
re than 13 semester hours).

-semester Warning—When, at the end of the eighth week of each
er, instructors file in the Office of the Dean the names of freshman and
more students who are doing unsatisfactory work, a notice of warning is
the student and a copy filed with the appropriate advisor. A warning
utes notice to the student to consult the instructor and advisor at the
t opportunity.

### and Dropping Courses

egistering, a student may add or drop courses only by means of an official
n adjustment form available in the Office of the Dean, Columbian
Student Services. Failure to submit the form when dropping a course
sult in a failing grade. The deadline for adding a course during the
fall or spring semester is the end of the second week of classes.
deadline for dropping a course without academic penalty is the end of
hth week of classes in the fall and spring semesters. A course dropped
the first three weeks of classes will not appear on a student's transcript.
se dropped between the fourth and eighth week will be assigned the
f *W* (withdrawal without academic penalty); an official withdrawal form
e submitted. The deadline for complete withdrawal from all courses
t academic penalty is the end of the ninth week of classes. After the
to the Dean's Council and receives permission.

### letes

ons under which the grade of *I* (Incomplete) may be assigned are
ed under Regulations.

ging an Incomplete—Incomplete work must be completed no later than
day of the examination period for the fall or spring semester immediate-
wing the semester or summer session in which the grade of *I* is assigned.
vork for the course is completed, the grade earned will be indicated in
n of *I/* followed by the grade. The indication of *I/* cannot be removed
e transcript. A grade of *I* that is not changed within this period
tically becomes an *I/F*. In cases of well-documented extenuating cir-
nces, an instructor and a student may jointly petition the dean or the
iate committee for additional time in which to complete the work of the
Such petitions should be submitted within the same period. The grade
not be changed by reregistering for the course here or by taking its
ent elsewhere.

### Dean's List

The name of any student who takes 15 semester hours or more of graded work in any one semester and attains a semester quality-point index of more with no grades below *B*− will be placed on the Dean's List fo semester. A course taken on a Pass/No Pass basis beyond the 15-hour min of other courses does not affect the student's eligibility for the Dean's Li are the semester hours of such a course computed in the above figures. A of No Pass, however, disqualifies the student from the Dean's List.

## THE ASSOCIATE IN ARTS DEGREE

The Associate in Arts degree may be granted to a student who has compl semester hours in arts and sciences with acceptable grades and has fulfil General Curriculum Requirements, listed below. The last 15 semester h the program of study must be completed in residence in Columbian C

## THE BACHELOR'S DEGREES

Columbian College offers programs leading to the degrees of Bachelor Bachelor of Science, and Bachelor of Music.

In cooperation with the School of Medicine and Health Sciences, a year curriculum leading to the combined degrees of Bachelor of A Doctor of Medicine is offered.

For teacher certification for Columbian College students, see the Sc Education and Human Development.

### The Standard 120-Semester-Hour Program

One hundred twenty hours of course work must be passed and a qualit index of at least 2.0 achieved in courses graded on a 4.0 scale. curriculum, major, and other requirements described below must be m

Each student must declare a major, usually in the sophomore year. A may change the major with the consent of the dean and of the depart committee concerned; the student must meet the requirements for major in effect at the time the change is approved. At least 60 hours o work must be taken outside the major-field department or major progra does not apply to the 129-hour Bachelor of Music curriculum nor to hour Bachelor of Arts curriculum in dance.)

See page 46 for an explanation of how the quality-point index is co See page 74 for scholarship requirements applicable specifically to dep tal majors.

All students, including those transferring from other institutions another school or division of this University, with major requirements or substantially met, must satisfy the residence requirement of Co College state below.

### The 90-Semester-Hour Program

The 90-semester-hour degree program is designed for the exception student. This program, which leads to the regular Columbian College makes it possible to graduate in three normal academic years with a to semester hours of credit instead of the standard 120. Students in this must complete all of the requirements for the three-year degree in the in which the 90th semester hour is achieved.

The requirements for this program are (1) 90 semester hours of cred in college courses (that is, the 90-hour requirement may not be re

earned through examinations); (2) completion of the chosen major-field
m and general curricular requirements; (3) grades of *A* or *A*− in at least
nester hours of course work and no grades below *C*−; (4) at least 60
ter hours of credit earned in 100-level courses; and (5) recommendation
major department or program.

e eligible for this program, the student must show evidence of excep-
academic ability by college record, performance in college courses, and
appropriate information.

interested student should make application directly to the major-field
mental chairman or program director as soon as possible, preferably by
d of the first year of study. The student's academic record to that point
f course, provide a useful criterion of eligibility.

ansfer student may qualify for graduation under the 90-hour program if
he completes at least 60 semester hours of the approved 90-hour program
umbian College, earns grades of *A* or *A*− in no less than 45 semester
of such course work at this University, and has no grades below *C*−.
udent who fails to maintain the required academic performance while
ng toward the 90-hour degree program simply continues for the standard
ur degree.

### nce

*he Standard 120-Semester-Hour Program*—A minimum of 30 semester
including at least 12 hours in the major field, must be completed in
nce in Columbian College. *Unless special permission is granted by the*
*o pursue work elsewhere, the work of the senior year must be completed*
*dence.* This requirement applies to students transferring within the
sity, to students transferring from other institutions, and to students in
ms leading to the Bachelor of Music and Bachelor of Arts in the field of

*he 90-Semester-Hour Program*—The last 60 semester hours, including at
2 hours in the major field, must be completed in residence in Columbian
e.

*mer Work*—Summer work in residence may be counted toward all
bian College degrees.

### ed Degrees of Bachelor of Arts and Doctor of Medicine

lidate for the combined degrees of Bachelor of Arts and Doctor of
ne must (1) complete the entrance requirements for the Doctor of
ne degree in the George Washington University School of Medicine and
Sciences; (2) complete the general Columbian College course require-
(3) earn 90 semester hours in the liberal arts, including a minimum of 30
nd-group courses in Columbian College; (4) obtain the approval of the
Columbian College at the time of entering the School of Medicine and
Sciences; (5) obtain the recommendation of the Dean for Academic
of the Medical Center at the completion of all prescribed courses in the
ar of the Doctor of Medicine program, at which time the degree of
or of Arts will be conferred (professional credit courses taken at another
ion do not count toward the combined degrees); (6) maintain through-
entire course the scholarship level required for graduation.

### Bachelor's Degree

bian College graduates who wish to receive a second bachelor's degree
tisfy the general College requirements, the requirements of their new

major and degree, and the 30-hour residence requirement. Student undergraduate degrees from other institutions or from other divisions University, if admitted to the College, must meet the same set of require

## PLACEMENT, WAIVER, AND CREDIT EXAMINATIONS

### Preliminary Placement Examinations

Many departments in Columbian College, including English, mathemati all foreign languages, require students to take placement tests to det level of proficiency or eligibility for specified courses. The student is pl an appropriate course on the basis of these tests. There is no charge student for placement tests, and no credit (advanced standing) is awar courses bypassed or waived as a result of these tests.

*English*—Students whose scores on either the Test of Standard English or on the English Composition Achievement Test suggest that th benefit from more intensive training in compositional skills may be a to Engl 9 or may be tested in vocabulary, spelling, grammar, standard and writing skill before placement in either Engl 9 or 10. Students scores indicate superior competence will be allowed to waive the requirement.

*English for International Students*—see page 25.

*Foreign Languages*—A student who has not been granted advanced and who wishes to continue in college the language begun in high sch take a placement examination in one of the following: Chinese, German, Greek, Hebrew, Italian, Japanese, Korean, Latin, Portuguese, or Spanish. Upon completion of the examination, assignment is mad appropriate course.

*Mathematics*—New students who wish to register in Math 30, 31, required, prior to registration, to take a placement examination in alg trigonometry; those wishing to register in Math 51 are required, registration, to take a placement examination in algebra.

### Earning Credit by Examination

Assuming there is no duplication of course work earned, a maxim semester hours of credit may be assigned for any combination of the f

*College Board Advanced Placement Tests*—See Admissions. Credi granted for college-level courses taken in an approved secondary substantiated by satisfactory performance on the Advanced Placeme

*College Board College-Level Examination Program (CLEP)*—See Ad Prior to matriculation, credit may be assigned for CLEP General Exa passed at the 50th percentile or above. Credit may be assigned for Subject Examinations passed at the level recommended in the Colle model policy. The General Examination in English composition a Subject Examinations are unacceptable for credit. After matriculati for CLEP Subject Examinations will not be assigned without special tion by the Columbian College department governing the subject in

*Special Departmental Examinations*—A student may request an ment of Columbian College to offer a special examination covering th matter of any specific course. (If an appropriate CLEP Subject Exa available, the department may choose to employ it.) The student evidence of sufficient background to have a reasonable command of matter. Departments reserve the right to deny such requests. Credit departmental examination is not permitted for the first two years

urses in a native language other than English. A student who has
ly taken examinations to waive course requirements may not subse-
ake examinations for credit in the same courses. Assigning credit (or
a requirement) by special departmental examinations will depend on
rtment's evaluation of the examination paper. These examinations will
be of at least three hours' duration. A fee of $50 for each course
ion is charged for preparation, administration, and grading of the
ion.

### Introductory Courses by Examination

departments in Columbian College, including English, history, and
, offer periodic waiver examinations for introductory courses. Such
ions may be attempted at the option of the student; a fee of $20 is
Specific departments should be consulted for further details. *Passing
examination does not entitle a student to any semester hours of credit.*

## L CURRICULUM REQUIREMENTS

dates for the degree of Bachelor of Arts or Bachelor of Science are
to a general arts and sciences curriculum until they declare a major
dents should plan to satisfy most of their general curriculum require-
ore they commit themselves to a specific major; most students select a
r the end of their sophomore year. General curriculum requirements
ished by the College faculty as a whole and administered through its
ommittees. Other curriculum requirements are administered by the
d departments or programs. (Bachelor of Music candidates are
directly into the departmental curriculum.)
s are obliged to demonstrate, either by course work or through
on, that they have attained a certain level of cultural literacy and
al competence. In the same fashion, they must also demonstrate that
experienced the richness of liberal learning and the diversity and
dness of all knowledge.
s must satisfy these requirements in eight distinct areas and should
o so in their first semester, because these fundamental competences
of knowledge often form a basis for future course work. No course
ken to fulfill requirements in more than one of the eight categories,
gh some courses may be listed in more than one category. Students
y all or part of a specific requirement either through course work or
ation.

nt categories of general curriculum requirements are listed below,
specifically approved courses. Additional courses beyond those
ch category may be authorized from time to time by the Curriculum
. Please consult the Office of the Dean, Student Services, for a
tal list of appropriate courses prior to registration each semester.
erwise specified, the indicated paired sequences of courses must be

–6 hours: Engl 9 or 10, and 11 or 12 or 13.
**tive and/or Logical Reasoning**—6 hours chosen from one of the
combinations: Phil 45 and 121; Stat 51 or 53 or 91, and 105 or 129;
2 or 129–30; Math 9 and 10, 30 and 31, 30 and 41, or 51–52; Phil 45
or 53 or 91.
**al Foundations and Development of Natural Science**—9 hours chosen
urses listed below, distributed so that 3 or 6 hours come from Group
6 hours come from Group B (the 6-hour group must be a paired

sequence): Group A: BiSc 3–4 or 11–12; Geol 1–2; Geol 5 and 105. Chem 3–4 or 11–12; Phys 1–2 with 5–6; Phys 9–10; Phys 21–22 wit

**Social and Behavioral Sciences**—6 hours chosen from one of the combinations: Anth 2 and 3; Anth 2 and 150; Econ 1–2; Geog 1 and 2; 2; PSc 3–4; Psyc 1 and 8; Soc 1 and 2.

**Creative and Performing Arts**—3 hours chosen from the following: or 41; Comm 75; Engl 81; Mus 3, 11, 12, 13, 19, or 20; Phil 162; TrDa 4 or 151.

**Literature**—6 hours chosen from one of the following combinati 163–64; Chin 181–82; Engl 51–52; Engl 61–62; Engl 71–72; Ger 5 103–4; Ger 112 and 114; Japn 111–12; Rel 9–10; Slav 91–92. (Ad students may satisfy this requirement by completing 6 hours of cour the 100-level in a single foreign literary tradition taught in t language.)

**Western Society and Civilization**—6 hours chosen from one of the combinations: AmCv 71–72; Art 31–32; Clas 71–72; Hist 39–40; H Hmn 1–2; Phil 51–52; Rel 1–2.

**Foreign Language or Culture**—either option A or option B as follo

A. Foreign Language—A student must demonstrate competence b elementary level in a language other than English taught at GWU. offering for admission four acceptable high school units of a sin language (that is, four years of study of that language) has sa requirement. A student who wishes to continue the same language high school must take the language placement test.

In order to satisfy this requirement, the student must demonstr tence at the level of the following courses, by either course work o tion (courses in the Romance languages must be completed with a or better): Chin 4 or 6; Clas 3 or 13 or 24; Fren 3; Ger 4 or 6; Ital 3; Ja Port 3; Slav 4 or 6; Span 3.

The student should be aware that in many instances foreign la required for the major or recommended as preparation for advanced student should consult the advisor so that foreign language may be appropriate, in the student's program.

B. Foreign Culture—6 hours chosen from one of the seven cate below. Courses listed singly may be combined with other single co the same category. (1) *East Asia*—IAff 91; Chin 163–64; Hist 195; H 111–12; Rel 160. (2) *Middle East*—Anth 177; Geog 154; Hist 193; P 161. (3) *Latin America*—Anth 172; Geog 161; Hist 161; Hist 162; P PSc 183. (4) *Africa*—Anth 178; Hist 116; PSc 181. (5) *Russia/So* Hist 145; Hist 146; Slav 71; Slav 91–92; Slav 161–62. (6) *South As* Rel 158; Rel 159. (7) *Western Europe*—Econ 147; Ger 141; Hist 136; Hist 141 and 142; PSc 130.

## THE MAJOR

In order to declare a major, all students must secure the advisor's s proper form (obtainable in the Office of the Dean, Columbian Col Services) and return the form to the Office of Columbian College. considered to have a major until this process is completed. T student receives academic guidance from a faculty advisor in th department.

In most cases, filing of the approved declaration form assures t admission to the major declared; however, if space, equipm requirements compel a department or major program to limit th

ents in that major, admission to the major may be on a selective or space-able basis.

change in degree candidacy within Columbian College (e.g., from Bachelor rts to Bachelor of Science) requires the permission of the Dean. The degree irements effective at the time the change is approved must be met.

### elor of Arts

Bachelor of Arts degree is offered with majors in the following fields:

ican Civilization
ican Literature
ropology
ed Mathematics
istory
istory/Fine Arts
gy
y
istry
se Language and Literature
cal Archaeology and
hropology
cal Archaeology and
sics
cal Humanities
uter and Information
ems
al Justice
(126-hour program)
Modern European Studies
sian Languages and Literatures
nics
Literature
amental Studies
rts
Language and Literature
Curriculum in the
al Arts
phy
Geology
Germanic Languages and Literatures
History
Journalism
Judaic Studies
Literature in English
Mathematics
Music
Philosophy
Physics
Political Communications
Political Science
Psychology
Radio–Television
Religion
Russian Language and Literature
Russian Literature and Culture—In Translation
Sociology
Spanish-American Literature
Spanish Language and Literature
Speech Communication
Speech and Hearing Science
Statistics
Statistics (Computer Science option)
Theatre
Zoology

### r of Science

chelor of Science degree is offered with majors in the following fields:

Mathematics
phy
ry
er and Information Systems
mental Studies
Geology (Engineering option)
Mathematics
Physics
Statistics
Statistics (Computer Science option)
Zoology

### -Study and Departmental Majors

re two types of undergraduate majors: the Field-of-Study major and the ental major. Seven majors—Classical Archaeology and Anthropology, l Archaeology and Classics, Early Modern European Studies, Environ- Studies, General Curriculum in the Liberal Arts, Judaic Studies, and Communications—although interdepartmental in nature, are gov- the regulations of the Departmental major.

Refer to the department concerned under Courses of Instruction to dete whether a major is Departmental or Field-of-Study.

## FIELD-OF-STUDY MAJORS

Each Field-of-Study major covers a carefully worked out field of coordi study and is under the supervision of the appropriate department an Columbian College Committee on Curriculum.

The Field-of-Study major requires no specific program of courses, alt the student is required to meet the overall general requirements for the d Ability to pass the Major Examination is assumed to be a convincing d stration that the student possesses the breadth, depth, and quality of knov of the major usually defined in terms of semester hours, courses, and Information on each field is obtainable from the department. Immediatel declaring a major, students should consult the appropriate department they may be assigned an advisor.

The Field-of-Study major places special emphasis on the intellectual opment of the individual student. Programs in the same major may depending upon the individual student's background, previous studi aptitudes. The student is expected to consult the advisor frequently, a special proseminars offered in some fields give the student further oppo for individual advice and direction in pursuing a program especially ada individual needs and abilities. A close student–advisor relationship is e for the student's success under the Field-of-Study major plan.

*Proseminar in the Major*—A proseminar is offered in most fields to h student acquire a coordinated knowledge of the chosen field through r study, and laboratory exercises. It is a presentation of the content and m of the major field as a whole through the organization and coordinatio knowledge obtained in the various formal courses in the major subject material not usually included in such courses. This course is not require departments, but, if it is elected, strict attendance is essential. Six se hours, but no qualitative grade, may be assigned. When registered course, the student has the privilege of occasionally visiting, subject approval of the instructor, any other appropriate course offered in the (Regular attendance in a course, either for credit or as an auditor, registration and payment of tuition.) Proseminars are open only to the who has been accepted as a candidate under that specific major.

*The Major Examination*—The Major Examination will normally be the close of the senior year: a student on a limited schedule may ta earlier than one calendar year before graduation. A student who fails Major Examination may, at the discretion of the Committee on Curricu re-examined at a later regular major-examination period. The Comm Curriculum has general supervision of the preparation, reading, and g Major Examinations. Major Examinations are held each semester on d by the department or departments concerned.

## DEPARTMENTAL MAJORS

Departmental majors, unlike Field-of-Study majors, are defined in credit hours, required courses, and the attainment of grades no lower in the minimum required second-group courses taken in the major student receives a grade of *D* in a second-group course required in t the major department or program may permit the course to satisfy a requirement even though it would not normally count toward the number of hours required for the major. However, the department or

nstead require the student to repeat the course until a satisfactory grade r better) is earned. (The department chair or program director must ize such repetition in a memo to the Office of the Dean, Student Services, the student may register a second time.) Once the student has completed urse with a satisfactory grade, credit hours earned the first time the was taken will count toward the minimum number of hours required in jor. Credit earned for the repetition will not count toward the degree. inimum specific requirements for Departmental majors are listed below ff of instruction of the department concerned. The chairman of the ment, or designated departmental advisor, should be consulted at ation concerning the student's program of courses; and the entire n, including electives, must be approved by the department. The t is also expected to consult the chairman or advisor in all matters g the program of studies, such as changes, substitutions, or withdraw- d especially concerning the student's progress in a course. A close t–advisor relationship is desirable.

**Majors**

e prior approval of the departments concerned, a student who com- he requirements of two major fields in Columbian College (for example, natics and physics, or English and French, or history and economics) duate with a double major. Such a student should consult with advisors wo departments concerned and officially declare both majors on the riate form available in the dean's office. A double major must be taken in ents offering the same degree (either the B.A. or the B.S.); a major field nbian College cannot be combined with a major field offered by another granting unit of the University.

**ciplinary Programs**

ar *Interdisciplinary Programs*—Programs include American Civiliza- assical Archaeology and Anthropology, Classical Archaeology and , Early Modern European Studies, Environmental Studies, Judaic and Political Communications.

al *Interdisciplinary Programs*—A student who finds no existing major am suited to individual educational goals may develop a special major , in consultation with appropriate departmental advisors. Final ap- f such a program rests with the Committee on Curriculum. Only s with valid and clearly defined academic goals will be approved, and ll be designated by a title suggested by the student to the Committee on um for approval. At least 45 semester hours of credit of the approved must be completed in Columbian College. Because of their broad ch interdisciplinary majors may not be combined with a double major. dent in an interdisciplinary program will be expected, during the emester of the senior year, to take a comprehensive examination ral or written) in the interdisciplinary field, or to undertake a senior ensive thesis, at the discretion of the student's interdepartmental ee.

l *Interdisciplinary Courses*—Under the supervision of the Committee culum, new courses combining the methods and insights of several es will be offered each semester. Interested students should consult nt *Schedule of Classes*, where such courses are numbered in the 700s. t wishing to use any of these courses to satisfy the general curriculum ents should consult the sponsoring department.

*General Curriculum in the Liberal Arts*—Directed by the Curriculu
mittee of Columbian College of Arts and Sciences, this program is des
provide a general education in the liberal arts, with or without anothe
as the student chooses. It offers opportunity for achieving a sub
acquaintance with each of the three divisions of knowledge through a s
of courses that cultivate a broad perspective in time and in national
cultural traditions. The committee appointed to advise students in the
consists of one representative each from the humanities, the social s
and the natural and mathematical sciences. For curriculum requirem
General Curriculum in the Liberal Arts, under Courses of Instruction.

## MINORS AND SECONDARY FIELDS

### Minors

Students who wish to familiarize themselves with a field outside the
may graduate with a minor in addition to the major. Not all Columbia
departments offer undergraduate minors; the requirements prescribed
that do are listed under the department involved. A student interes
minor should consult faculty advisors in the department concer
declare both major and minor programs on the appropriate form ava
the dean's office.

At least one-half of the course work required for a minor must be
residence. Grades of C− or better must be earned in second-group
including such courses transferred as advanced standing from anothe
tion. Courses passed with a grade below C− may be used to fulfill a m
curricular requirement but may not be counted toward the total m
credit hours required for the minor.

When taken by a student enrolled at the University in a school o
Columbian College, such minors are designated Secondary Fields. T
curricular and scholarship requirements apply to Secondary Fie
minors.

Minors are available in the following fields:

American Civilization
Applied Ethics
Archaeology
Art History
Art History/Fine Arts
Biological Anthropology
Biology
Botany
Chemistry
Chinese
Classical Humanities
Creative Writing
Cross-Cultural Communication
Dance and Dancing
Dance Education
Dance History and Criticism
Economics
Fine Arts
French Language and Literature
General Anthropology
Geography
Geology
German
History
Journalism
Judaic Studies
Literature in English
Mathematics
Music
Philosophy
Physics
Political Science
Psychology
Religion
Russian Language and Li
Russian Language and Cu
Translation
Sociocultural Anthropolo
Sociology
Spanish Language and Li
Speech Communication
Speech and Hearing
Statistics
Statistics (Computer Sci
Theater
Zoology

**lary Fields**

students enrolled at the University but outside the College may pursue e minors as Secondary Fields, such study is permitted College students er schools of the University. Secondary Fields are available in the School cation and Human Development in early childhood education, exercise ort, human services, secondary education (preparation for certification), education, and travel and tourism; in the School of Engineering and d Science in computer science, electrical engineering, engineering s, operations research, and engineering administration; in the School of ment and Business Administration in business administration; and in ool of International Affairs in international affairs. Interested students consult with their academic advisors.

mbian College students are limited in the number of hours they may take ses outside the College (so-called "professional credit" courses). Refer to agraph below.

## ACADEMIC REGULATIONS

**Outside Columbian College**

in schools of the University other than Columbian College may be fulfill curriculum requirements, with approval of the major depart- ubject to Columbian College rules governing allowable hours of profes- redit.

t for majors in applied mathematics and students in Naval Reserve Training Corps programs, no more than 9 semester hours of courses by degree-granting divisions of the University other than Columbian may count toward bachelor's degrees in Columbian College. (No credit ed toward the degree for ExSA courses.) Students who have extraordi- sons for exceeding the 9-hour limit must receive prior approval from . In the case of those pursuing a Secondary Field, there is an 18-hour d prior approval of the Dean is not required.

Science—For information on naval science courses and the Naval Officers Training Corps, see Naval Science, under Courses of on.

**earning Program**

um of 15 semester hours in Service–Learning Program courses may be toward bachelor's degrees in Columbian College.

**n Additional Semester Hour of Credit**

, no deviation is permitted from the number of semester hours of ven in parentheses after the title of each course. In exceptional nces, however, and with the prior approval in writing of the instruc- he dean, a student may register for and earn an additional semester redit in certain appropriate second-group (upper-division) courses by ignificant amount of extra work as assigned and supervised by the .

**ass Option**

r senior student in Columbian College who is in good standing may, pproval of the advisor and the dean, take one course a semester and grade of *P*, Pass, or *NP*, No Pass. No student will be allowed to take

more than four pass/no pass courses under this regulation. The stud
however, also receive grades of *P/NP* in the proseminar for field-
majors and in other courses normally using such grades. A student m
up for the pass/no pass option at registration. Under no circumstanc
student change from pass/no pass status to graded status, or vice versa,
end of the drop period or the eighth week of class. Courses require
student's major or minor field (including those courses required for t
that are offered by other departments) may not be taken on the pass
basis. A transfer student may not choose this option until the second
of enrollment in this University.

**Tutorial Study**

A junior or senior of demonstrated capacity, with a special interes
subject matter of a regularly listed course, may be permitted to take
study in residence under the personal direction of the instructor, in ac
with the rules of the appropriate department and with the approval of t
Credit under this plan is limited to the specific semester hours
designated for each course in the list of courses of instruction. It
frequent and regular conferences between the student and instructor.

## PREMEDICAL CURRICULUM

A premedical student who intends to work toward a bachelor's degre
the general requirements of Columbian College stated above and ma
the major-field curricula of any Columbian College department. Each
cal program must be approved by the premedical advisor. For adm
most medical schools, the student must have a minimum of 90 semest
applicable toward a degree in an approved college of arts and scienc
hours must include

1. *Biology*: 8 semester hours, including laboratory. This may be
general biology or zoology but may *not* include separately credited c
botany.
2. *Chemistry*: 8 semester hours of general inorganic chemistry (wh
include qualitative analysis), including laboratory, and 6–8 semester
organic chemistry, including laboratory.
3. *Physics*: 8 semester hours, including laboratory.
4. *English*: 6 semester hours. This may be the usual introductory
composition course or its equivalent.

Many medical schools have additional entrance requirements
which are courses in biochemistry, embryology, histology, genetics,
ematics. Even when such courses are not actually required, they are
recommended.

With the exception of these specific requirements, applicants are
follow their personal interests in developing their premedical courses
A well-balanced program, rather than a specific field, is the criterion
an applicant is judged. It is not advisable to take courses that appea
subject matter in the medical program.

Although well-qualified candidates are eligible for admission afte
ing the minimum 90 semester-hour requirement, the majority of app
found to be better prepared for the study of medicine after four years
work.

## PARATION FOR LAW SCHOOL

oad liberal education is the best undergraduate preparation for law school. mbian College, therefore, does not prescribe a prelegal curriculum. How- through its Office of Student Services, the Columbian College provides nts with advice about academic preparation for law school.

## DUATE SCHOOL OF ARTS AND SCIENCES

H. Solomon
*ciate Dean* E.A. Caress
*tant Deans* A.D. Andrews, D.A. Rowley, C.E. Rice

### LTY 1987–88

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Soltan, R.P. Stoker, S. Tuch, D.H. Ullman, R.J. Valentino, A. Viter
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Hiltebeitel, H.D. Junghenn, D.R. Lehman, B. Reich, L.A. Rothblat

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Suarez/Torres, D.L. Terrell, H.J. Viola, D.K. Wyatt, N.S. Young

## HISTORY AND ORGANIZATION

The Graduate School of Arts and Sciences is responsible for advanc
and research leading to Master's degrees in the arts and sciences and th
of Doctor of Philosophy. Graduate programs at George Washington U
were first formally organized under the Graduate School in 1905,
several decades of gradual growth in a number of departments. In
Graduate School was discontinued. Columbian College, the University
arts college, then assumed responsibility for the Master of Arts and
Science degrees, and a newly created Graduate Council administered
of Philosophy programs. Professional schools took responsibility for
degrees in the professional fields.

1967 the Graduate Council and the Graduate Division of Columbian ge were consolidated into a new Graduate School of Arts and Sciences. raduate programs in the arts and sciences leading to the degrees of Master rts, Master of Fine Arts, Master of Forensic Sciences, Master of Music, ter of Science, Master of Science for Teachers, Master of Science in usic Science, and Doctor of Philosophy are under the Graduate School. addition, a Master of Philosophy degree is awarded by the School, upon mmendation of the appropriate department, to students who have success- completed the General Examination for the Doctor of Philosophy degree. e School is under the direction of the Graduate Faculty of Arts and nces. It is the responsibility of the Faculty to set the requirements for ssion to the School, to provide courses and programs of study and rch for its students, to establish academic standards for its degrees, to mmend to the Board of Trustees the awarding of degrees, to lay down lations as needed for the operation of the School, and generally to rvise its activities.

e administration of the School is vested in the dean, who is chairman of Dean's Council, which is responsible to the Faculty of the School for all y matters.

## ISSION REQUIREMENTS

ication forms for admission to graduate study are obtained from the Office e Dean of the Graduate School of Arts and Sciences. When completed, application forms must be submitted to this office, together with college cripts, letters of reference, and other information as required by the rtment or program. Admission is dependent on departmental recommen- n and approval by the dean.

plicants must have academic backgrounds of excellence, usually with s, or equivalent, in the fields in which they intend to study for advanced es. Normally, a *B* average (or equivalent) from an accredited college is red. With evidence of special promise, such as high Graduate Record ination scores, an applicant whose academic record falls short of a *B* ge may be accepted as a probationary student. The minimum does not e automatic acceptance. The departments may, and often do, set higher sion standards. Moreover, the number of spaces available for new ate students limits the number that can be accepted. Students who apply ir senior year must have completed their baccalaureate work before ation in the Graduate School and must present evidence of such etion. The Graduate School requires the Graduate Record Examination al test only) for all Ph.D. applicants except foreign nationals. Some ments require the general test for applicants for the master's degree, and equire a Graduate Record Examination subject test for all applicants. All ational students from countries in which the official language is not h (including students holding degrees from foreign universities at which is the language of communication) are required to submit scores from st of English as a Foreign Language (TOEFL). International students who nitted to the Graduate School of Arts and Sciences as degree candidates required to take an English as a Foreign Language (EFL) placement test stered by the University prior to registering at the University. Based on commendation of the English for International Students office, the may be required to register for EFL classes, which, in turn, may restrict nber and type of graduate-level classes that can be taken in the student's ield of study. Graduate credit is not granted for the EFL course work, ough the course work is required.

*Application for Admission*—Applicants who are requesting fellowsh
port must submit completed applications by the dates indicated
Graduate School's application information. Completed applications for
ate study without fellowship support must be received by July 1 for
semester, by November 1 for the spring semester, and by April 15
summer sessions, unless otherwise noted on the Graduate School's appl
information.

*Readmission*—A student who wishes to resume a graduate program
had been interrupted must file an application form to be conside
readmission. Readmission is not guaranteed, and the application is su
review by the department concerned and the dean. The student
required to take qualifying examinations on the course work com
Application forms are available in the Graduate School Office.

## REGULATIONS

See Admissions; Registration; Fees and Financial Regulations; Regulat

In addition, the Graduate School publishes a Student Handboo
academic year which contains updated information on the School's p
regulations, and other matters of concern to enrolled or admitted studes
the responsibility of the student to be aware of the information conta
this *Bulletin* and the Handbook.

### Grades

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*
Incomplete; *IP*, Progress; *W*, Authorized Withdrawal, *Z*, Unauthorize
drawal; *CR*, Credit.

The grade of *I* indicates that a satisfactory explanation has been give
instructor for the student's failure to complete the required work for a
The Incomplete must be made up before the lapse of one calendar y
Incomplete for regular course work that is not changed within one
year remains permanently as a grade of *I* on the student's record. The g
cannot be removed by reregistering for the course here or by ta
equivalent elsewhere.

The grade of *IP* is given for all thesis and dissertation research cours
the thesis or dissertation is completed. Upon the satisfactory completi
thesis or dissertation, the grade *IP* is changed to *CR* automatically. The
*CR* is given for Advanced Reading and Research courses.

### Scholarship Requirements

Graduate students are required to maintain a minimum cumulati
average of *B* (3.00) in all course work taken following admissio
Graduate School. Individual departments may require a higher aver
Department of English requires a 3.25 average. Only graduate cour
taken at the University that forms part of the student's program of stud
included in the cumulative grade average.

In the case of a student who receives a grade of *F* for a course in the
of studies, the Graduate School will require a written statement
department justifying the student's continuance in the Graduate Sc
outlining the program to be followed. Continuation is contingent
dean's approval. When a grade of F is received for a course in the p
studies, the grade is included in the student's grade point average w
not the course is repeated.

student may repeat a course in which a grade of *C* or above was received when permitted to do so by the department concerned, unless the course ription states that the course may be repeated for credit. A written ment to this effect must be submitted for approval to the dean's office by appropriate departmental advisor. It is then filed with the Registrar. If a se is repeated, the first grade received remains on the student's record and cluded in the student's grade point average.

graduate student may take an advanced undergraduate course (courses bered 101–200) for graduate credit only upon the approval of the dean and department at the time of registration. Such approval is granted only with provision that the student complete additional work in order to receive uate credit.

**ram of Studies**

program of studies must be approved by the dean and the department sor and filed in the Graduate School Office no later than November 1 for uate students entering in the fall semester or March 15 for graduate nts entering in the spring semester. A program of studies may be revised, necessary, by obtaining the approval of the departmental advisor and the . The revision must be filed in the Graduate School Office. A completed e cannot be dropped from the program of studies unless its inclusion was to an error in advising or an administrative error. Such a change in the am requires the approval of the dean.

*bationary Students*—It is especially important for those admitted as tionary students to consult with their departmental advisor as early as ble regarding completion of additional requirements specified in the letter mission. The exact conditions for admission of probationary students be satisfied.

**nuous Enrollment**

tudents must be continuously enrolled while working toward a degree, t during the summer sessions. Students who have completed all course thesis, and dissertation registration requirements and are within their am of studies deadline must register for Continuous Enrollment each ster. There is no charge for this type of registration. If continuous ment is not maintained, the student is dropped from the degree program s a leave of absence is granted by the Graduate School.

**of Absence**

dent who is temporarily unable to continue the program of studies may t leave of absence for a specific period of time, not to exceed one ar year during the total period of degree candidacy. When the period of has expired, it is the student's responsibility to register for the next ter. If a student fails to register, degree candidacy is terminated.

**awal**

ate students who intend to withdraw from the Graduate School should the School in writing. The last day for *complete* withdrawal without nic penalty is at the end of the eighth week of classes.

**tion Requirements**

dents must file an Application for Graduation at the time of registration semester or summer session in which they intend to graduate. Students

must be registered in the Graduate School during the semester they p
graduate. Master's and doctoral candidates may graduate in May, Febru
September. Students who have completed the requirements for a degr
have not yet been awarded the degree will be issued a letter to this effec
request.

## DEGREES

Listed below are the degree programs of the Graduate School of Ar
Sciences and the specific degrees offered, by field. The programs are di
by the departments concerned. Degree programs that bridge two or
departments are directed by committees composed of members of the d
ments concerned. For further information write to the dean or the chair
the appropriate department.

Students with special academic goals may pursue individualized pro
of study toward the Master of Arts or Master of Science, subject to appro
the Committee on Individual Programs and the dean. Courses must be
from a minimum of three fields, with a maximum of 18 hours from a
field. A majority of courses must be taken within the Graduate School
and Sciences. The comprehensive examination is a final essay in whi
integration of the program of study is demonstrated. The School also
Master of Arts and Master of Forensic Sciences degrees in specific ac
areas at off-campus locations (see page 91).

### Graduate Fields

The graduate course work offered in support of the degree programs
following list is shown by department in this *Bulletin*.

| | Degrees |
|---|---|
| **I. Humanities** | |
| American Civilization | M.A. |
| American Literature | M.A. |
| Art | M.F.A. |
| Ceramics | |
| Design | |
| Painting | |
| Photography | |
| Printmaking | |
| Sculpture | |
| Visual Communication | |
| Art History | M.A. |
| English Literature | M.A. |
| History of Religions—Hinduism | M.A. |
| Museum Studies | M.A. |
| Music | M.A. |
| Music (Performance) | M.Mus. |
| Religion | M.A. |
| Religion and Medical Care | M.A. |
| Religious Education | M.A. |
| Russian Language and Literature | M.A. |
| Theatre | M.F.A. |
| Women's Studies | M.A. |
| **II. Social Sciences** | |
| Administrative Sciences | M.A. |
| Anthropology | M.A. |
| Criminal Justice | M.A. |

| | | |
|---|---|---|
| conomics | M.A. | Ph.D. |
| istory | M.A. | Ph.D. |
| egislative Affairs | M.A. | |
| olitical Science | M.A. | Ph.D. |
| ublic Policy | | Ph.D. |
| ublic Policy | M.A. | |
| Environmental and Resource Policy | | |
| Gerontology | | |
| Philosophy and Social Policy | | |
| Telecommunications Policy | | |
| Women's Studies | | |
| ociology | M.A. | Ph.D. |

**hysical and Mathematical Sciences**

| | | |
|---|---|---|
| pplied Mathematics | M.A., M.S. | |
| pplied Statistics | M.S. | |
| hemical Toxicology | M.S. | |
| hemistry | M.S. | Ph.D. |
| nvironmental Science | M.S. | |
| orensic Sciences | M.F.S., M.S.F.S. | |
| eobiology | M.S. | Ph.D. |
| eochemistry | M.S. | Ph.D. |
| eology | M.S. | Ph.D. |
| lathematical Statistics | M.A. | Ph.D. |
| lathematics | M.S. for Teachers, M.A. | Ph.D. |
| hysics | M.A. | Ph.D. |
| atistical Computing | M.S. | |

**iomedical and Related Sciences**

| | | |
|---|---|---|
| natomy | | Ph.D. |
| t Therapy | M.A. | |
| ochemistry | M.S. | Ph.D. |
| ological Sciences | M.S. | Ph.D. |
| Biology | | |
| Botany | | |
| Zoology | | |
| nical Microbiology | M.S. | |
| netics | M.S. | Ph.D. |
| crobiology | M.S. | Ph.D. |
| hology | | Ph.D. |
| armacology | M.S. | Ph.D. |
| ysiology | M.S. | Ph.D. |
| chology | M.A. | Ph.D. |
| ech–Language Pathology and Audiology | M.A. | |

**laster of Science–Doctor of Medicine Program**

ts interested in the joint Master of Science and Doctor of Medicine n must meet the requirements for admission to the Graduate School of d Sciences and to the Doctor of Medicine degree program of the School icine and Health Sciences.

Master of Science program consists of a minimum of 30 semester hours it. A maximum of 12 semester hours of credit for graduate-level courses ted as a part of the Doctor of Medicine degree curriculum (and not applied toward the bachelor's degree) will be allowed in fulfillment of uirements of the Master of Science degree. The remaining 18 semester f work, which in most programs includes a thesis, must be work in the edical sciences normally required for a Master of Science degree in the e School of Arts and Sciences.

### Joint Master's–Juris Doctor Program

Students interested in working concurrently toward the Juris Doctor de
the National Law Center and a master's degree in the Graduate School
and Sciences must meet the requirements for admission to both schools
requirements in each degree program. It is possible for a student to co
work for both degree programs within four years.

### Joint Doctor of Medicine–Doctor of Philosophy Program

A joint program is available to qualified students who seek both the Do
Medicine and Doctor of Philosophy degrees. The requirements that m
fulfilled for both degrees are identical to those currently and sep
established in the School of Medicine and Health Sciences and the Gr
School of Arts and Sciences.

A student working toward these degrees may apply a maximum
semester hours of approved course work in the School of Medicine and
Sciences toward the minimum of 48 hours of course work required to
for the General or Cumulative Examination for doctoral candidacy. This
work is normally taken during the semesters that alternate with the
program and in the years following the award of the M.D. degree. The st
research for the dissertation may begin concurrently with the final 24 se
hours of graduate course work leading to the General or Cumulative Ex
tion. The estimated time for the completion of this dual program is ap

In order to enter the joint program, a prospective student must first a
and gain admission to both the Graduate School of Arts and Sciences
School of Medicine and Health Sciences separately through establishe
dures. Upon admission to both schools, the student may then apply for
tion with the joint program. Work toward the Doctor of Philosophy d
performed under the jurisdiction of a departmental doctoral committe

## REQUIREMENTS FOR THE DEGREES

### The Master's Programs

Unless otherwise specified, the requirements listed below are appli
candidates for the degrees of Master of Arts, Master of Fine Arts, M
Forensic Sciences, Master of Music, Master of Science, Master of Sc
Teachers, and Master of Science in Forensic Science.

1. *General Requirements*—For a master's degree program including
the satisfactory completion of a minimum of 30 semester hours of
graduate work, including 6 semester hours of thesis research, is requi
master's degree program that does not include a thesis, the number of
hours of approved graduate course work is determined by the depart
normally consists of from 30 to 36 semester hours. The program wi
thesis is not an individual student option and is not available
department. Departments can and often do set requirements above
mum required by the Graduate School.

Work taken to make up deficiencies is never counted as pa
requirements leading to a master's degree. Upon approval, up to one-
required graduate work may be taken in courses offered by the other
institutions of the Consortium of Universities of the Washington Met
Area, Inc., or by another degree-granting division of this University.
transferred from another institution (see Transfer of Credit, below), th
of semester hours which may be taken at an affiliated Consortium ins
reduced by the number of hours accepted as transfer credit.

master's degree candidates must complete degree requirements by the ar date specified in the program of studies, which in no case will exceed ars. Extensions beyond the specified time period may be granted in ional circumstances, but the student will be required to register and pay redit hours of Reading and Research each semester.

*cademic Work Load*—Full-time students register for 9 to 12 semester ach semester; part-time students must register for 6 semester hours each er. Students who work more than 20 hours per week must be part-time s. These requirements do not apply to students who have fewer than 9 r hours (full time) or 6 semester hours (part time) remaining to te their programs. No more than 15 semester hours may be taken during semester.

nts who are employed more than 20 hours per week are expected to or part-time academic progams, and they will not be permitted to for more than 6 credit hours in any semester.

*ansfer of Credit*—A maximum of one-quarter of the semester hours of e course work required for a degree may be approved for transfer to the e School from the Division of Continuing Education, another degree- division of this University, or another accredited college or university. ansfer of credit to be approved, *all* of the following conditions must be course work must have been taken prior to admission to the Graduate it must be approved as part of the student's program of studies, it must e been applied to the completion of requirements for another degree, it post-baccalaureate graduate-level course work, it must have been taken he past two years, and the student must have received a grade of *B* or each course for which a transfer of credit is requested. This action requested in writing and approved by the departmental advisor and the transcript of the course work must be on file before the request can be ed.

*cial Program Requirements*—Master's degree candidates in some must demonstrate a reading knowledge of an appropriate foreign . Candidates in certain of these programs, and in certain other , must demonstrate competence in quantitative methods, normally by prescribed courses in Statistics/Computer and Information Systems. grams have special requirements in other subjects. Courses taken at graduate level to fulfill these requirements may not be counted in the f graduate credit hours required for these programs. For further on on these and other regulations, consult the Student Handbook and tments and program faculty concerned.

*Thesis*—The main purposes of a master's thesis are to demonstrate t's ability to make independent use of information and training and objective evidence of constructive powers in a chosen field. The gisters for six semester hours of thesis research and must complete no later than four calendar years after the initial registration. n for thesis research entitles the student to the advice and direction nber of the faculty under whom the thesis is to be written. The thesis ust be approved by the faculty member who will be directing the thesis—in its final form, with one copy and a certificate of approval the thesis director and by at least one departmental reader—must be to the dean no later than the date announced in the University All theses must meet the form, style, and other requirements set forth let, *Information Concerning Theses and Dissertations*, available in f the Dean.

6. *Master's Comprehensive Examination*—Most master's degree c
must pass a Master's Comprehensive Examination in the majo
Examinations are held on dates fixed by the departments, so that rest
filed in the Graduate School Office no later than the day before t
meets to approve the list of graduates. The nature and form of the ex
is the responsibility of the department or program.

A student who fails to pass the Master's Comprehensive Examina
with the approval of the department and the dean, repeat the exam
the next scheduled examination date. If the student fails a second
further opportunity to take the examination is permitted.

**The Doctor of Philosophy Program**

The minimum requirements for the doctoral program are as follow

1. *General Requirements*—The program leading to the degree o
Philosophy requires the satisfactory completion of a minimum of 7
hours of approved graduate work for entering students whose high
degree is a baccalaureate. A minimum of 48 of these hours must b
preparation for the General Examination. Entering students who
earned degree is a master's degree are required to register for a mini
semester hours of approved graduate work, no fewer than 24 of whi
taken in preparation for the General Examination. While comp
dissertation portion of the program, the student must register fo
semester hours of dissertation research, depending on the numbe
completed prior to the General Examination. The exact number
hours required for any part of the total program is assigned by each
and may exceed the minimum required by the Graduate School.

Doctoral degree candidates have an overall eight-year time limit
tion of all degree requirements. Doctoral students in the first u
programs shall meet the calendar deadline for completing this unit
in the program of studies. Completion of the first unit includes
completion of course work and the General Examination. Doctoral
the second unit of their programs, i.e., dissertation research, sh
approved topic on file in the Graduate School Office by the date spe
program of studies, which in no case will exceed two years from
tion date of the General Examination. All remaining doctoral deg
ments shall be completed by the date specified in the program of stu
in no case will exceed five years from the completion date of
Examination. If any of the deadlines specified above are not me
academic approval for an extension, which may be granted in
circumstances, the student must register and pay for 6 credit hour
and Research each semester. These hours will not be counted tow
tion of the degree.

2. *Academic Work Load*—Full-time students register for 9 to
hours each semester; part-time students must register for 6 semeste
semester. These requirements do not apply to students who have
9 semester hours (full time) or 6 semester hours (part time) r
complete their programs.

3. *Transfer of Credit*—Entering students who do not hold a ma
may request transfer of up to 24 semester hours of credit towar
degree for acceptable post-baccalaureate graduate work taken at
degree level at George Washington University or another accredite
university.

*Special Program Requirements*—Certain doctoral programs require a ing knowledge of one or two appropriate foreign languages, or high iciency in one language. Some require a reading knowledge of one language dition to competence in quantitative or other subject matter; some require petence in other subject matters without a language requirement. Compe- e in quantitative methods is normally demonstrated by passing certain cribed courses in Statistics/Computer and Information Systems. Courses n at the undergraduate level to fulfill special program requirements may e counted in the number of graduate credit hours required for the student's oral program, except that up to 6 hours of course work at the 100 level may counted, with the approval of the department and the Dean, so long as the ber of hours of dissertation credit in the student's program is 12 or more. further information on these and other regulations, consult the Student book and the departments and program faculty concerned.

*The General Examination*—**Each student is required to complete the** ral Examination no later than the semester following the completion of u requirements. The General Examination is composed of a written ination five to six hours in length in each of the areas of study comprising udent's total program; the time permitted between each examination is mined by the administering department. Some departments permit one or reas of study to be "written off"; that is, a special, shorter examination is after a year of course work in the area. A cumulative examination system effect in the fields of chemistry and physiology, and in the field of ology a system of two comprehensive examinations is used. Students in fields should consult the appropriate department for information about stem.

**tudent who fails to pass any part of the General Examination may, in** tional circumstances, and with the approval of the department and the repeat the examination at the next scheduled examination date. If the nt fails a second time, no further opportunity to take the examination is tted.

**sfactory performance on the General Examination is required for admis-** the second unit of the Doctor of Philosophy degree program, consisting dissertation and final examination. Admittance to the second unit is tted only if the student's General Examination committee finds that the nt's performance on the examination and in course work gives a good tion of success in the second unit. Passing of comprehensive examina- **t the minimum level does not necessarily give this indication.**

*The Degree of Master of Philosophy*—Upon departmental recommenda- nd approval of the dean, the degree of Master of Philosophy may be ed to students who have successfully completed all requirements for the of Philosophy degree up to and including the General Examination and been approved for the second unit. Not all departments recommend ts for this degree.

*The Dissertation and Final Examination*—**A dissertation is required of** octoral candidate as evidence of ability to perform scholarly research nterpret its results. The candidate normally enrolls for Dissertation h upon completion of the General Examination; however, the candidate gister for up to 6 semester hours of Dissertation Research during the time neral Examination is being completed. If the dissertation is not com- within five years from the date the General Examination is com- the student will be required to retake the General Examination.

later than the date specified in the University Calendar, the candidate ubmit to the dean the original and one copy of the dissertation and an

abstract for inclusion in the Announcement of the Final Examination a reproduction by University Microfilms, Inc.

When the dissertation has been approved by the director, two members Doctoral Program Committee, and the dean, the candidate takes the Examination, an oral examination that is open to the public. A commit examiners (composed of Graduate School faculty and, when appro outside scholars) conducts the examination. A sufficient number of cop the dissertation must be provided by the candidate for the members Examination Committee. If the candidate passes, he or she is recommend the Graduate School for the degree of Doctor of Philosophy.

Detailed information regarding regulations for the form and reproduct the dissertation is available in the Office of the Dean. The successful can for the doctorate is required, before receiving the degree, to pay a fee applied toward the expense of printing the Announcement of the Examination and the basic service rendered by University Microfilms, I

## FELLOWSHIPS AND FINANCIAL AID

A limited number of graduate teaching assistantships and University F ships are available in most departments of instruction to students regist the Graduate School of Arts and Sciences. A limited number of other k sponsored and University awards are also available. Awards are bas academic excellence, and only full-time degree candidates in the Gr School are eligible to be considered. Appointments are made on a year- basis and are not automatically renewable.

Students applying for admission who also wish to apply for a fell should submit the fellowship application and the application for admis February 15; the necessary transcripts, Graduate Record Examination and letters of recommendation should also be on file by this date. St currently enrolled in the Graduate School should submit only the fell application by February 15 and should check with their departments c ing additional application requirements.

International students applying for teaching assistantships should Financial Aid, International Students, for regulations governing the a ment of international graduate teaching assistants.

Forms are available at the Office of the Graduate School of Arts and S Filing the fellowship application entitles the student to consideration awards available in the student's department.

Students who wish to apply for loans should indicate their intent to the application for admission. Information concerning loans is conta booklet available from the University's Office of Student Financial Ai

## COOPERATIVE PROGRAMS

The American Studies Program at George Washington University h cooperative arrangements with the American Studies Program of the S ian Institution that offer students in the field of American civiliz opportunity to take advantage of the Washington environment. Membe staffs of the Smithsonian's American Studies Program, National Mu American History, National Portrait Gallery, and National Collection Arts offer seminars and tutorial instruction in fields that provide stud an unusual opportunity to develop new dimensions in the disci American civilization. This program of study is open to students toward the degrees of Master of Arts and Doctor of Philosophy and is to prepare them for research, teaching, and museum-related careers.

Art Department of George Washington University has made arrange-
with the Smithsonian Institution to offer graduate programs of study and
in museum studies leading to the degree of Master of Arts in the field
istory with a concentration in museum training. The Department has
milar arrangements with the Corcoran Gallery of Art, the Freer Gallery,
hhorn Museum and Sculpture Garden, the Museum of African Art, the
Museum of American Art, the Phillips Collection, the Renwick
and the Textile Museum.

gram of study leading to the degree of Doctor of Philosophy in the field
ican civilization with emphasis on library research and collections is
by George Washington University by arrangement with the Library of
s. The coordinator of the Library Program and the staff offer an
on seminar and other courses and supervise students in reading and
and in work on such library problems as indexing, cataloging, and
phy.

rther information concerning these programs, contact one of the
g offices at George Washington University: the Graduate School of Arts
nces for those who are interested in any of the fields listed above, the
artment for those interested in art museum training, the American
Program for those interested in the field of American civilization.

Washington University, in cooperation with two other universities
Folger Shakespeare Library, helped establish the Folger Institute for
nce and 18th-Century Studies as a cooperative venture in graduate
n the humanities. Fifteen universities are now member institutions.
(limited to 12 students each) are offered each semester under the
of American and foreign scholars. The Folger Library forms the core
titute. All participants enrolled in the seminars are granted access to
ctions of rare books, manuscripts, and reference materials of the
All registered students are eligible to apply for admission to one or
the seminars, although priority in enrollment will be accorded
students working on dissertations and postdoctoral scholars from the
g institutions.

information, including a listing of seminar topics, is available in the
he Graduate School of Arts and Sciences or at the Folger Shakespeare

iversity and the National Bureau of Standards have entered into a
ve agreement to further educational opportunity at both the Univer-
he Bureau. This arrangement holds promise for graduate study and
with emphasis in the physical sciences.

## FOR WASHINGTON AREA STUDIES

er for Washington Area Studies serves as the focal point at the
for interdisciplinary work related to Washington and its regional
hrough teaching, advanced research, publications, and public events
de tours, exhibits, and conferences, the Center works to promote a
derstanding and appreciation of the history, culture, literature, and
icies of the Washington region.

## PUS DEGREE PROGRAMS

ate School of Arts and Sciences is currently offering the following
grams off campus: (1) the Master of Arts in the fields of Administra-
es, Criminal Justice, Legislative Affairs, and Public Policy (with a
ion in Telecommunications Policy); and (2) the degree of Master of
iences. Not all of these programs may be available in any given year.

## SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

*Dean* L.D. Leonard
*Associate Dean* J.R. Shotel

### FACULTY 1987–88

*Professors* J.G. Boswell, L.J. Breen, F.J. Brown, M.A. Burns, M.S. Cas
R.S. Cottrell, Jr., D.W. Dew (*Research*), L.H. Elliott, R. Ferrante, J.D.
Gleazer, Jr. (*Visiting*), J.A. Greenberg, D. Hawkins, J.C. Heddeshein
Holden, D.H. Holmes, G.L. Horrworth, R.N. Ianacone, R.K. Ives, E.W
Jr., D. Linkowski, D.A. Moore, L. Nadler, S.R. Paratore, D.C. Pa
Phelps, M.N. Rashid, J.R. Shotel, G.W. Smith, J.E. Snodgrass, L.M.
C.E. Vontress, L. Winkler
*Associate Professors* P. Finnerty-Fried, M.B. Freund, C.H. Hoare, A.J.
T.J. Rosegrant, D.M. Saunders, G.E. Schou, N.J. Sobel
*Assistant Professors* S.S. Beck (*Visiting*), V.M. Camerlengo (*Visiti*
Chalofsky (*Visiting*), L.H. Cuenin, W.F. Lynch (*Visiting*), H. Nashm
Putnam, J.M. Taymans
*Instructors* S.M. Cahill, E.S. Fabian, T.K. Ginter (*Visiting*), J.A. Land
ing), T.J. Martin, E.C. Rach, S.E. Spivack (*Visiting*), C.B. Stapp, P.A.
(*Visiting*)

#### Members of the Advanced Graduate Faculty

J.G. Boswell, J.L. Breen, F.J. Brown, M. Burns, M.S. Castleberry, R.S
Jr., L.H. Elliott, R. Ferrante, J.D. Fife, P. Finnerty-Fried, M.B. Fre
Greenberg, D. Hawkins, J.C. Heddesheimer, C.H. Hoare, D.H. Hol
Horrworth, R.N. Ianacone, R.K. Ives, E.W. Kelly, Jr., D. Linkowski, A.
D.A. Moore, L. Nadler, S.R. Paratore, D.C. Paup, L.R. Putnam, M.N
D.M. Saunders, J.R. Shotel, G.W. Smith, J.E. Snodgrass, N.J. So
Stallings, J.M. Taymans, C.E. Vontress, L. Winkler

#### Committees*

EXECUTIVE COMMITTEE

J.G. Boswell, M.A. Burns, A.J. Mazur, M.N. Rashid, J.E. Snodg
Vontress

CURRICULUM COMMITTEE

P. Finnerty-Fried, D. Hawkins, D.H. Holmes, G. Horrworth, A.J.
Nadler, D.C. Paup, D.M. Saunders

FACULTY COMMITTEE

S. Cahill, R.S. Cottrell, M.B. Freund, W.F. Lynch, D.C. Paup, L. Wi

SCHOOL, COMMUNITY, AND ALUMNI AFFAIRS COMMITTEE

C.H. Hoare, H. Nashman, J.M. Taymans, C.E. Vontress

STUDENT COMMITTEE

E. Fabian, J.A. Greenberg, L.R. Putnam, P.A. Sullivan, three stude

* The dean and the assistant dean of the School of Education and Human Develo
officio members of all committees.

## DUCTION

versity began offering professional courses for teachers in 1904–5, and it established a Division of Education. In 1909 the Division of Education became the Teachers College, which in its early years was concerned with teacher preparation on the undergraduate level.

28 the Teachers College became the School of Education and greater n was made for advanced study. Since that time the School has ed to grow; it now comprises a broad range of graduate and under- programs. To reflect the current scope of its offerings, the name chool was changed in 1978 to the School of Education and Human ment.

chool of Education and Human Development prepares teachers, human nd service industry personnel, resource and support personnel, and rators for professional service. The School also offers opportunities to ced professionals to extend and enrich their education. The programs ned to meet the broad needs of persons who seek knowledge and skills y to provide effective learning and teaching, research, services, and ip in a variety of settings. The School's programs address the needs of interested in careers in elementary and secondary schools but also the preparation of individuals for all areas of education and human nent, covering the life span from pre-school through the adult years in public and private sectors of society.

a degree in Education and Human Development is not only a on for teaching in schools but also for careers in a variety of public and uman service and service industry settings. A significant portion of red courses are in the liberal arts. In addition, the programs provide ities for students to develop critical thinking and reasoning, as well as p, organizational, and planning skills. Emphasis is placed upon ng the human relationship qualities that are essential in fields that nvolvement with people in all age ranges and from all walks of life.

hool of Education and Human Development is the administrative unit epartments: Educational Leadership, Human Services, Human Kinet- Leisure Studies, and Teacher Preparation and Special Education. In to programs of study leading to its degrees, the School offers credit and t workshops designed specifically to meet the unique needs of itan area school systems and other clientele in private industry and ent.

curricula are tailored on an individual basis for liberal arts graduates uates of other professional schools who are interested in teaching or in nan services areas. The School also offers a wide range of courses for who wish to renew licenses and for provisional teachers who wish to or teaching certificates.

ory and clinical facilities are provided by the University Reading Cen- e Counseling Laboratory. Field experiences are provided in coopera- public and private schools, social and health agencies, museums, ns in the business community, and community and junior colleges. edule of courses is arranged to meet the convenience of both full-time ime students.

### for Careers in Teaching

of study for teaching careers are based upon the assumption that cher should have a broad general education, mastery of specialty

studies related to the content of instruction, and professional knowl
competencies.

The relative emphasis placed upon each of these aspects of
education for teaching varies in accordance with the purposes of each
For instance, since elementary school teachers teach all subjects, the
content preparation of greater breadth and less specialization than s
school teachers.

It is the view of the School of Education and Human Developmen
acceptable minimum education for teaching requires four years of
study or the equivalent in part-time study. For superior preparation
are urged to plan for five years of full-time study or the equivalent in
study.

The student may choose any one of the following plans to achieve
educational preparation for teaching or for other education-related f

1. Upon receiving the bachelor's degree in education, he or she m
teaching position and, after acquiring some professional experience,
the School for graduate study leading to the master's degree. Durin
year of teaching, in particular, graduates are encouraged to establi
contact with the School of Education and Human Development, who
will provide supportive assistance to beginning teacher graduates of t
This plan enables students with bachelor's degrees to begin their
careers and to use their work experience to enhance graduate study
follow.

2. The student may choose to pursue full- or part-time gradu
leading to the master's degree immediately after receiving the
degree.

3. A student whose bachelor's degree is in one of the liberal arts
may choose to complete the requirements for certification for te
studying in one of the teaching fields in a program tailored to
particular needs.

**Education for Careers in Human Services and Human Development**

Programs of study for human service and human development
offered in the School of Education and Human Development. At the
uate level, these include programs in human services, travel and to
exercise and sport science. At the master's degree level, programs inc
education, community counseling, education policy studies, exerci
human resource development, museum education, rehabilitation
and tourism development and travel administration. Specialist pr
offered in adult education, counseling, human resource develop
special education. Doctoral programs are offered in human resour
ment and adult education, educational administration and poli
counseling, and human development.

At the undergraduate level, programs of study provide a str
arts/general education component, specialty studies, professional
supervised field experiences. Graduates are prepared to enter a spe
field or continue with graduate studies. Master's degree progra
vanced specialized studies in a selected field, and doctoral progra
leadership, research, and advanced professional skills.

**Professional Courses for Non-Education Majors (Teacher Certificatio**

Columbian College students in a number of major fields are perm
their electives to complete up to 18 credit hours of professiona

s required for teaching in junior and senior high schools. Students may
te with 120 semester hours or may choose to complete all courses
d for teacher certification and graduate with a program in excess of 120
er hours. Students interested in taking these courses should contact the
f the dean of the School of Education and Human Development for
g.

men and sophomore students may take professional education courses
clude field work experiences. Some of these courses make it possible for
s who are undecided about their choice of a career to have an
nity to test teaching and some of the many related human service areas.
education courses are open to non-education majors. It is recommend-
students check with the appropriate departmental office for more
information on courses that are open.

School of Education and Human Development offers secondary fields of
n early childhood education, exercise and sport, human services,
ary education (certification), special education, and travel and tourism.
information is available in the brochure "Secondary Fields of Study"
e in the office of the dean.

## ATIONS

missions; Registration; Fees and Financial Regulations; Regulations.

## CHELOR'S DEGREES

hool of Education and Human Development offers undergraduate
s leading to the degrees of Bachelor of Arts in Education and Human
ment (elementary education, elementary education early childhood
on, special education, and human services) and Bachelor of Science in
Kinetics and Leisure Studies (exercise and sport science and travel and
).

### e Requirements for Freshmen and Sophomores

haracter and an academic background appropriate for the program of
contemplated are required.

rements for admission to the freshman and/or sophomore years are as

acceptable certificate of graduation from an accredited secondary
showing at least 15 units,* which must include four years of English; at
o years of one foreign language; two years of science, preferably with
ry instruction; two years of social studies, one of which must be
n history; and two years of college-preparatory mathematics.
e principal's statement that the applicant is prepared to undertake
work.
ndardized test scores submitted on College Board Achievement Tests
sh composition and mathematics and on the Scholastic Aptitude Test,
e American College Testing battery.

commended that the College Board examinations be taken in December
ry of the senior year. Scores on tests taken in the junior year may be
d. Arrangements for tests are the responsibility of the applicant and
e made with the College Board Admissions Testing Program, CN 6200,
n, N.J. 08541–6200, not less than one month before the date of the tests.

epresents a year's study in a secondary school subject, including in the aggregate not
120 sixty-minute periods, or the equivalent, of prepared classroom work.

In applying for the tests, the applicant should specify that the scores b
the Office of Admissions, George Washington University, Washing
20052.

American College Testing battery scores are also accepted. The a
should request that these scores be sent to the Office of Admissions
from the American College Testing Program, Iowa City, Iowa. It is reco
ed that the applicant take the tests in October of the senior year.

The School of Education and Human Development will consider
quacy of the qualifications of an applicant who, because of unusual
stances, does not meet all of the formal requirements stated above. Th
may require appropriate scholastic aptitude tests. Students admit
deficiencies in secondary school units will be required to begin remov
deficiencies within the first year, by appropriate courses or examinat

International students may be considered for admission with an e
foreign secondary certificate. A student presenting such a certificate
show competence in the English language and may be required to e
full-time program in English as a Foreign Language before beginning
a degree program. Requirements will be determined on the basis of a
Proficiency Test administered on campus. A candidate who submits
580 or above on the Test of English as a Foreign Language (TOEFL
excused from taking further course work in English as a Foreign Lan
will be required to take the English Placement Examination on cam

Students who have been out of secondary school for three years or m
not meet the above requirements may take a special battery of admis
by contacting the Office of Admissions or may be considered for p
admission to the School of Education and Human Development.
admitted provisionally is required to complete a trial program of 15
hours of course work with a quality-point index of 2.50 or higher. The
of courses to be taken in the trial program must be made in conferen
faculty advisor.

All undergraduates admitted directly to the School of Education a
Development are assigned academic advisors at the time of admiss
sors are designated to provide continuity of advising for students t
their years of undergraduate study. The program for each studen
approved by a faculty advisor.

Since each student's program is defined by individual needs, it is
that students have a clear concept of their major interest in educati
human services. In the case of teacher education students, they
familiar with the certification requirements of those localities in w
expect to teach. Information on state licensing requirements is avai
Career Services Center, located in the Academic Center.

### Admission With Advanced Standing

Requirements for admission of students transferring from other
accredited colleges and universities and from other divisions of this
are as follows.

Students who have accumulated 15 hours or more of academ
another regionally accredited college or university with an acceptab
and acceptable grades may be admitted to the School of Education
Development as transfer students with advanced standing. Stu
students must have a quality-point index of 2.50 or better for co
work and must meet freshman requirements. Advanced stand
awarded for properly certified courses for which the student receive

ter, provided that such courses are comparable to the curriculum
ents of the degree at GWU. In the case of course work from a two-year
no more than 60 to 63 semester hours of credit may be applied as
l standing toward the total number of semester hours required for the
s degree.

gh a grade of *D* in a course is not acceptable for transfer, the course
sed to satisfy a curriculum requirement. Credits earned with a *D* grade
however, be counted toward advanced standing.
hool reserves the right to refuse credit for transfer in whole or in part
w credit provisionally.
e responsibility of the student to have an official transcript sent
rom each institution formerly attended to the Office of Admissions,
ashington University, Washington, D.C. 20052.
ts may transfer from another division of this University into a degree
in the School of Education and Human Development. The student
ent an accumulated quality-point index of 2.50 or higher at the time
. A student wishing to transfer into the School from another division
iversity must submit a formal application of transfer to the Office of
ns.

s applying for transfer from another accredited college or university
nother division of this University, who do not meet the formal
nts for admission with advanced standing or whose previous aca-
ords raise doubts of their ability to complete degree requirements
ly, may be provisionally admitted to the School of Education and
evelopment. To be admitted into the School's degree program, a
lly admitted student must complete a prescribed trial program of 15
ours of course work with a quality-point index of 2.50 or higher.
ction of courses to be taken in the trial program must be made in
e with a faculty advisor in the School of Education and Human
ent. A conference concerning plans for study as a degree candidate is
f each applicant at the beginning and end of the trial program. Upon
completion of the trial program, the student who has submitted a
didate application will be advanced to degree status.
iling for admission to the bachelor's program in Human Services are
submit a copy of their current state nurse's registration (license) in
the official transcripts. Nurses may be awarded advanced standing
ompleted in a community or junior college program. They may also
anced standing of up to 45 credit hours for course work completed
a three-year nursing diploma program in a teaching hospital.
of associate's degree nursing programs may be awarded advanced
up to 63 credit hours.

**holarship Requirements for Undergraduates**

s regarding academic standing, probation, suspension, withdrawal,
on of students, required placement examinations, and waiving
y courses by examination are the same as those for Columbian
ey appear on pages 66–67 and 70–71 of this *Bulletin*.

WORK LOAD

7 semester hours of credit constitute a normal program. A student
ity-point index of 3.00 or higher may, with the permission of the
for 18 or 19 hours. No student may enroll for more than 19, except
on of the dean.

The following work load regulations apply to both graduate and u ate students. Permission of the dean, in the circumstances outlin requires a request form that is to be filed in the office of the dean at registration.

Students employed 15 hours or less a week may carry a normal college work.

Students employed from 16 to 25 hours a week may enroll for 12 o Those with a quality-point index of 3.00 or higher may, with spec sion of the dean, enroll for 15 or 16 hours.

Students employed from 26 to 34 hours a week may enroll for 9 o Those with a quality-point index of 3.00 or higher may, with spec sion of the dean, enroll for 12 or 13 hours.

Students employed 35 hours or more a week may enroll for 6 Those with a quality-point index of 3.00 or higher may, with spec sion of the dean, enroll for 9 or 10 hours.

Students who increase their hours of employment after registrati time during a semester must report immediately to the dean so programs may be adjusted if necessary.

Graduate students employed full time may take a maximum of hours, unless special permission to take more is granted by the de

## REQUIRED PLACEMENT EXAMINATIONS

*English*—Students whose College Board English Composition A Test scores suggest that they will benefit from more intensive compositional skills may be assigned to Engl 9 or may be tested in spelling, grammar, standard usage, and writing skill before placeme Engl 9 or 10.

*Foreign Languages*—A student who has not been granted advanc and wishes to continue in college the language begun in high scho a placement examination in one of the following: Chinese, Fren Greek, Hebrew, Italian, Latin, Russian, or Spanish. Upon compl examination, assignment is made to the appropriate course.

*Mathematics*—New students accepted for registration in Mat quired, prior to registration, to take a placement examination in trigonometry; those wishing to register in Math 51 are requir registration, to take a placement examination in algebra. (See spe matics requirements listed under elementary or secondary educa

## EARNING CREDIT BY EXAMINATION

Undergraduate students may earn credit up to a maximum of performing satisfactorily on College-Level Examination Program special departmental examinations provided by the departments College of Arts and Sciences on an individual basis. Passing a wai tion does not entitle the student to any semester hours of credit in Education and Human Development. A limited amount of cr assigned for selected service school instruction.

Students interested in becoming certified to teach who have lor's or graduate degrees in fields other than education may certification requirements by taking the CLEP tests or special examinations. See pages 21–22 for general information on the CL for information on special examinations offered by departments.

**ments for the Degrees**

recommended for a degree, a student must satisfy the admission, ce, scholarship, and curriculum requirements. The amount of course quired for bachelor degrees is as follows:

*lor of Arts in Education and Human Development*—elementary educa- mentary education, early childhood education (double major), special on, and human services, 126 semester hours.

*lor of Science in Human Kinetics and Leisure Studies*—exercise and ence and travel and tourism, 120 semester hours.

CE

ites for the bachelor's degree must complete satisfactorily a minimum mester hours in the School of Education and Human Development.

IST

gible for the Dean's List a full-time student must obtain a quality-point 3.5 on courses completed during the past semester. A part-time to be eligible, must obtain a quality-point index of 3.5 on the last 12 hours of course work. Such part-time students must be in residence t be continuously enrolled.

SHIP REQUIREMENTS

ystem of grading and of computing scholarship, see page 45.
ity-point index of at least 2.50 is required before permission is granted dent teaching in the senior year. In order to graduate, a student must uality-point index of at least 2.25.
ion—A student who fails to maintain a quality-point index of at least laced on probation. The student remains on probation as long as the below 2.25 or until probation is removed by the Student Committee.
sion—A student on probation who fails to raise the index to 2.25 e time specified may be suspended.
ent suspended for poor scholarship may, within 10 days, appeal the ugh the dean to the Student Committee. If the case appears to be le and the student's scholarship seems likely to improve, the Commit- eadmit the student on probation. A student denied readmission may er a lapse of a calendar year, petition the Committee through the dean ission. A student suspended twice will not be readmitted.

RRECT ENGLISH

ent whose written or spoken English in any course is unsatisfactory ported by the instructor to the dean. The dean may assign supplemen- without academic credit, varying in amount with the needs of the the work prescribed is equivalent to a course, the regular tuition fee . The granting of a degree may be delayed for failure to make up such in English to the satisfaction of the dean.

M REQUIREMENTS

helor's curricula at least 60 semester hours must consist of courses above 100 or the equivalent in transfer credits.

ASS OPTION

senior student who has a cumulative quality-point index of 2.50 or , with the approval of an advisor and the dean, take one course a

semester and receive a grade of *P* (Pass) or *NP* (No Pass), which will b on the student's transcript but will not be reflected in the student point index. No student will be allowed to take more than four pa courses. Students must sign up for such an option at registration. Stu change from pass/no pass status to graded status, or vice versa, after registration only with the permission of the dean and the course Courses required in the student's major field may not be taken on t pass basis. A transfer student may not choose this option until t semester of enrollment at this University.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (A Withdrawal) may be assigned are described under Regulations.

*Changing an Incomplete*—When a grade of *I* is assigned, the should normally set a period within which the uncompleted work (e final examination or a required paper) must be made up. When requ has been completed, it is the responsibility of the instructor to chang of *I* as appropriate. If work is not completed, the instructor will decid to change the grade of *I* to *F* or to allow the *I* grade to remain. The cannot be changed by reregistering for the course here or by equivalent elsewhere.

NATIONAL TEACHER EXAMINATION

The National Teacher Examination is required for teacher educat Students who take the Examination receive individual reports of and may avail themselves of the regular transcript services of the Testing Service.

**Bachelor of Arts in Education and Human Development**
**Teacher Education Programs**

Teacher education programs leading to the degree of Bachelor Education and Human Development (elementary education, elemen tion/early childhood education, and special education) are planned (1) a general education component, (2) a strong academic backgrou to one or more teaching fields, (3) a mastery of professional kno skills necessary for the beginning teacher, and (4) development needed for success in teaching.

GENERAL EDUCATION

The general education component is an integrated course of study teacher education students appropriate depth and breadth in the and sciences. The general education component provides the practical knowledge gained from studies in languages, mathematics history, philosophy, literature, and the arts.

The following is the general education curriculum for the Bachel Education and Human Development degree with major fields in education, elementary education/childhood education, and specia Certain introductory general education courses may be waived regulations explained elsewhere in this *Bulletin*, and higher-level be substituted in the same field. Students should consult th regarding waiving and substituting courses. Waiving a course doe reduction in semester-hour requirements.

The following courses are required. Engl 9 or 10, 11 or 12, and 72; Math 9 and 10; 6 credit hours in biological science and 3 in

vice versa; 9 credit hours of social science courses; SpHr 11; and (for
ts in elementary education and special education only) HmKn 122.

FESSIONAL STUDIES

essional studies consist of introductory education and human develop-
ourses that students take in their freshman and sophomore years. These
introduce students to the broad field of education, provide basic
dge about human development, and afford initial field experiences in
onal and human development settings.
rofessional course requirements for elementary education and early
ood/elementary education are TrEd 50, Educ 71 and 72. Preprofes-
course requirements for special education are Educ 71; SpEd 57, 58;
Ed 105.

TY STUDIES

cialty studies provide teacher education students with a mastery of the
e, skills, concepts, ideas, values, and facts that constitute their field of
zation. It encompasses both concentrated study and knowledge of the
s of inquiry appropriate to the specialty area.
content of a student's specialty studies depends upon the teaching
n for which the student is preparing. The student may begin specialty
during the first two years.

SIONAL EDUCATION

ic professional information, skills, and attitudes needed by beginning
s are provided through a sequence of courses to be taken throughout the
ars of undergraduate study. Lectures and class discussions are closely
ated with field work.
prescribed courses in special methods are concerned primarily with
s of initiating, guiding, and evaluating learning experiences dealing
content of teaching fields. They attempt to bring to the student specific
ons drawn from the accumulated experience of successful teachers. In
, the courses review the teaching-field content currently in use in

d-semester sophomore students in teacher preparation programs must
pplication for permission to complete the professional studies compo-
he junior and senior years. Applications may be obtained in the Office
ean or the Office of Laboratory Experiences. Academic advisors must
end students for the professional studies component. A writing sample
ed.

nts with an education major must be approved for student teaching
the eighth semester by their academic advisors. A grade-point average
is required as well as a valid medical certificate indicating that the
has taken a T.B. test and is free of tuberculosis.
acher education programs and their requirements are as follows.

**ry Education Program**

EDUCATION REQUIREMENTS (See General Education curriculum, above.)

SSIONAL STUDIES (See Preprofessional Studies, above.)

Y STUDIES

ired courses are HmKn 122, 3 semester hours each of U.S. history.

geography, and economics, and 3 semester hours each of art and mu
courses.

PROFESSIONAL COURSES

The required courses are Educ 104, 112, 180; TrEd 105, 110, 111, 1

**Special Education**

GENERAL EDUCATION REQUIREMENTS (See General Education curriculum, ab

PREPROFESSIONAL STUDIES (See Preprofessional Studies, above.)

SPECIALTY STUDIES

Same as the elementary education program above, plus Psyc 101.

PROFESSIONAL COURSES

The required courses are TrEd 102, 189, 170, 103, 190, 101, 199, 160, 112, 180; TrEd 110, 118, 128.

**Elementary Education/Early Childhood Education Program**

Early childhood education can be selected as a second major in co with the elementary education major. The preprofessional studie education, specialty studies, and professional courses are the sam required for elementary education. In addition, students are re complete TrEd 132, 150, 152, 153, and 154.

**Bachelor of Arts in Education and Human Development**
**Human Services Program**

The Human Services Program is designed for persons who are en wish to work in the following representative types of human ser hospitals and health care agencies, residential centers, cultural in substance abuse rehabilitation programs, correctional institutions, tary agencies.

The program includes a core of course work in the human services experiences in diverse human services settings, and academic concep selected academic departments of the University. Each program is in planned after evaluation of the student's professional and educat ground and long-range goals.

Students planning to major in human services take the followi Engl 9 or 10, 11 or 12, 51–52; Comm 1, 121; one course chosen from or 12 or Stat 51 or 53; BiSc 3–4 or an alternative approved science credit hours of courses in the social sciences that have been appro advisor, including a course in professional ethics and at least 6 hou or political science and 9 hours of anthropology and/or sociology electives. The core program consists of 39 credit hours, including Educ 71, 72, 104; HmSr 176, 182, 195; SLP 152; and 9 additional core program selected with approval of the advisor. The concentrat of 24 credit hours and is selected from the following fields: early education, rehabilitation services, special education, adult educa services administration, and human resource development.

**Bachelor of Science in Human Kinetics and Leisure Studies**
**Exercise and Sport Science**

Students who plan to major in exercise and sport science take t courses in the first two years of study: Engl 9 or 10 and 11 or 12;

from American civilization, anthropology, economics, geography, olitical science, psychology, or sociology; two courses selected from Chem 3–4, Geol 1–2, Math 9–10, or Phys 1–2 or 9–10; HmKn 103, 29, 130, 150, 151, 158, and four ExSA or HmKn courses totaling a of 9 credits and selected with the approval of the advisor; 3 credit lectives. In the third and fourth years, the following courses are taken: 2 or 71–72; Comm 1 or 111 or SpHr 11; ExSA 100; HmKn 134, 138, 152, 159, 161–62, 171, and two additional courses selected with of the advisor; 27 credit hours of elective courses approved by the

**f Science in Human Kinetics and Leisure Studies**
**l Tourism**

who plan to major in travel and tourism take the following courses: 0, 11 or 12, and 101; Econ 1–2; Accy 51; BAd 51, 140; Comm 1 or 2 or 72 and 180 or equivalent; Stat 51 or 53 or equivalent; two courses credits in each of the following four groups—mathematics; a foreign biology, chemistry, geology, or physics; American civilization, eco- eography, history, political science, psychology, or sociology. Core quired in the program include T&T 104, 113, 114, 143, 144, 145, 146, 93, 249, 250, and one course selected with approval of the advisor. A ncentration is chosen from the following areas: business administra- raphy, cross-cultural studies, psychology, computer science, lan- rcise and sport science, human services, international affairs, or an ized course of study selected with the approval of the advisor.

**TE STUDY**

l of Education and Human Development offers graduate programs the degrees of Master of Arts in Teaching, Master of Education, Arts in Education and Human Development, Education Specialist, of Education.

te work, grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum ail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, zed Withdrawal; *CR*, Credit. Grades *A*, *B*, *C*, and *F* are counted in the quality-point index (see page 46).

r a grade has not been assigned, the symbols *I* (Incomplete) or the *W* d Withdrawal) will be recorded. The *I* indicates that a satisfactory has been given to the instructor for the student's failure to he required work of the course. An instructor recording a grade of *I* lly stipulate a date by which work must be completed. The as the responsibility for changing the grade of *I* to an appropriate completion of work or, if work is not completed by the stipulated mining whether the grade of *I* should be changed to *F* or allowed to he record.

**ect English**

t whose written or spoken English in any course is unsatisfactory orted by the instructor to the dean. The dean may assign supplemen- without academic credit, varying in amount with the needs of the he work prescribed is equivalent to a course, the regular tuition fee The granting of a degree may be delayed for failure to make up such n English to the satisfaction of the dean.

## THE DEGREE OF MASTER OF ARTS IN TEACHING IN THE FIELD OF MUSEUM EDUCATION

The School of Education and Human Development offers an intensi ciplinary program in museum education. The program is designe selected graduates, postgraduates, and professionals for work in art science museums; zoos, aquaria, or nature centers; and historical sites. Graduates qualify to serve as liaison persons between s museums and as professionals in museum-related private and publ

### Admission

To be admitted to the program in museum education an applicant m a bachelor's degree from an accredited institution; (2) submit th references attesting to quality of academic record and work experie be interviewed by the Selection Committee or make alternative a specified by the Committee. Skills in communication, a desire t learn from museum collections, and an ability to work with essential. Evidence of strong undergraduate, graduate, or professi ence in such fields as American studies, anthropology, art history the biological or physical sciences is desirable.

### Plan of Study

All degree candidates take five sequential core courses in three semesters beginning in June and ending in April of the followin student also pursues four elective courses in a chosen museum-rela ic discipline. Two carefully supervised field placements provid seum education experience. In the fall semester, students serve week as museum resource consultants to schools or alternative sites. In the spring semester, students hold four-day-a-week inte museum or museum-related organization. For details, write t Museum Education Program, George Washington University, 2201 Washington, D.C. 20052.

## THE DEGREE OF MASTER OF EDUCATION

*Elementary Education*—The Master of Education in the field o education is designed for those with an undergraduate degree in than education. The minimum 45-semester-hour program inc work for students who wish to become eligible for certification the elementary school level; additional course work in content needed to meet specific jurisdictional requirements for certificat

*Secondary Education*—The Master of Education in the field education is designed for those with an undergraduate degree with substantial course work) in a field taught in secondary sch semester-hour program provides eligibility for teacher certifi cludes 24 hours of required courses in education theory and pe hours that may be in either education or the subject area intended

## THE DEGREE OF MASTER OF ARTS IN EDUCATION AND HUMAN DEVELOPMENT

The degree programs leading to the Master of Arts in Educati Development are designed to provide students with specialized skills required for advanced professional competence in a varie al, human development, human service, and service industry

m of study involves a combination of classroom and field-based learning
ences tailored to a professional specialty and individual student needs.
ts engage in a wide range of teaching and research approaches that
the School's commitment to excellence in professional education.
diversity of master's programs in the School of Education and Human
pment reflects its belief that education and human development com-
multifaceted enterprise reaching persons of all ages in a variety of
s. These programs develop professional knowledge, skills, and attitudes
ll enable graduates to foster human learning, growth, and development
viduals throughout society. Depending on the program specialty, stu-
re prepared to pursue careers in schools, universities, community-based
man service organizations, cultural and leisure institutions, and busi-
d government settings.
er's programs are available in the fields listed on the following pages.

**stration of College Student Development Services**

us of this program is on the development of broad-based administrative
nagement skills adapted for use in programs and services that foster
student development. The program provides preparation in administra-
unseling, group facilitation, leadership training, and organizational
ment.

39-semester-hour program includes courses in foundations of college
develoment, college students and their communities, group theories
hniques, higher education in the United States, and foundations of
ing and human development. The program also includes supervised
nce, a practicum, and seminars as deemed appropriate.

**lucation**

ogram is planned for those planning careers as learning specialists,
trators, counselors, and consultants in the field of adult education. In
to persons with academic training in education, individuals with
e in many other fields can combine their knowledge in a specific field
duate training in adult education and thereby begin a career transition
lt education.

-semester-hour program includes courses in adult education, program
in adult education, adult learning, and current issues in adult
programs. The program includes 15 semester hours of elective courses,
e student plans in consultation with a faculty advisor. This portion of
ram offers an opportunity to select courses especially suited to
al career interests.

**ng**

ter's programs in counseling are designed to provide three specialty
ations and one subspecialty concentration for entry-level positions in
nal counseling. Program graduates are prepared to specialize in a
field and to work in a variety of settings in which professional
ng is offered. All counseling concentrations require the equivalent of
years of study and provide core learning experiences that combine
nal and behavioral studies with supervised laboratory, practicum, and
p experiences. Some programs have specific prerequisites in addition
neral admissions requirements. The programs are accredited by the
or the Accreditation of Counseling and Related Educational Programs
Council on Rehabilitation Education.

The core course of studies for all program concentrations include work in the foundations of counseling, human behavior and devel mental health problems, testing and appraisal, career development, in and group counseling, cross-cultural counseling, and research and st

### Community Counseling

This is a 48-semester-hour program. Candidates who complete the pro prepared to enter the counseling profession in a variety of human settings, including welfare and other social service agencies, penal ins court systems, employment centers, allied health agencies, governmen agencies, community college counseling centers, employee assista grams, and private practice.

### School Counseling

This 48-semester-hour program provides professional preparation for uals to become certified as counselors in public and private scho program is designed to provide students with the requisite knowl skills to provide professional counseling, assessment, consultation, ance services in a school setting.

### Rehabilitation Counseling

This 51-semester-hour program prepares rehabilitation counselors persons who are physically, mentally, emotionally, or socially di assume or resume their place in society. The rehabilitation counse with the client in developing a rehabilitation plan to assist in suc independent living, job placement, overcoming substance abuse, and social, or developmental disabilities that may prevent the indivi leading a normal life.

### Employee Assistance Counseling

This subspecialty can be elected as part of either the community cou rehabilitation counseling programs. The subspecialty is designed graduates as professional counselors in employee assistance pr business, industry, and government settings.

### Curriculum and Instruction

This program is designed to prepare teachers and other educational for increased responsibilities in the planning, implementation, and of curriculum and instruction.

The 33-semester-hour program includes study in curriculum de research and evaluation of instructional practice, teacher education special populations, and school policy and management. A program tion may include advanced study in elementary education, a con secondary education, English as a second language, education of the talented, reading, or special education. A practicum is required.

### Education Policy Studies

The program in education policy studies is designed for students w develop skills in the technical, political, and managerial aspects o policy analysis. Emphasis is placed on developing both a broad un of the political and social environment in which education policy is and the technical competence to undertake independent analysis

e. Internships are offered in a variety of federal, state, and local

6-semester-hour program includes course work in the policy-making planning, evaluation, and current social policies influencing educa- least 9 hours of electives must be taken in a field of specialization. The may elect to write a thesis in place of 3 semester hours of course work.

**ary/Secondary Administration**

gram provides the entry-level professional with preparation for certifi- n leadership positions, such as principal, assistant principal, and ent head in elementary and secondary schools. Candidates must have a n of two years of successful teaching experience.

3-semester-hour program includes courses in fundamentals of educa- ministration, foundations of curriculum development, supervision of on, the K–12 principalship, supervision in the elementary and second- ols, school business management, human relations in educational nent, and school law. Course requirements are intended to be flexible be tailored, with the approval of a faculty advisor, to accord with the d established competencies of individual students.

**Science**

gram is designed to develop competencies to assess physical fitness; therapeutic activities; conduct exercise programs; evaluate program ness; identify sports injuries, EKG abnormalities, and anxiety factors fitness; and apply principles of exercise physiology and kinesiology al conditioning and performance.

6-semester-hour program includes courses in motor learning and nce, advanced concepts in motor development, fitness evaluation and prescription, sports medicine, principles and concepts of employee ness programs, and exercise, stress, and cardiac rehabilitation. Practi- portunities on campus are available in the University's Runner's ardiac Rehabilitation Exercise Program, and the Stress Testing and Prescription Program. A variety of off-campus practicum sites are also

**ducation**

gram is designed so that a student may select a concentration in ration, teaching, or curriculum. The program helps to prepare students istrative positions in academic affairs, public relations, finance, and ent in colleges and universities. The course of studies offers an review of the history, scope, present status, and trends of higher in the United States in comparison to selected systems of higher in other parts of the world. Students gain knowledge and skills the governance, organization, and administration of colleges and es.

semester-hour program includes courses on higher education in the ates, administration of higher education, and the community/junior n internship is required.

**source Development**

ram is designed for persons entering or advancing in positions with training, education, and development activities, in business, government, and other large organizations in the public or private

sector. The program is interdisciplinary, and students are encourage their programs to individual career needs and objectives.

The four required courses in the 39-semester-hour program inclu and education in human resource development, design of training consultant–client relationships, and current issues in adult learning Field work in cooperating Washington-area business, industry, go and community organizations may be a part of the learning experie

**Individualized Master's in Education and Human Development**

This program provides the opportunity to develop an individualize lum that cuts across existing fields, both within the School of Edu Human Development and between the School and other schools a ments of the University and the Consortium. The program is design specific, identified career and professional objectives of applicants unique needs. The flexible program structure can be tailored to prep and emerging fields in education and human development.

This program of 36 semester hours is available within or acro departments of the School of Education and Human Develop program must contain a 12-semester-hour core curriculum co courses in human development, social/historical/philosophical fou education, and curriculum. The remaining 24 semester hours must directly to the program objectives and bear a direct relationship to areas identified above. A minimum of 6 semester hours of fieldw equivalent, must be a part of the program.

**Individualized Master's in Human Kinetics and Leisure Studies**

This program is designed to permit students to pursue a course o meet unique professional goals for special areas and fields in hum and leisure studies. The program allows students the opportunity of studies that cuts across program offerings either within the de across departments. A set of program objectives is specified for e ual, based on the background and professional goals of the student to the overall objectives of the School.

This is a 36-semester-hour program, with specific course work d consultation by the advisor and student. Total semester hours m than 36 if additional courses are needed to meet the student's state A practicum and oral comprehensive examination are required.

**International Education**

This program is designed for persons who are entering or a positions associated with training, education, adult learning, and activities in diverse settings that require international unders program provides knowledge of other countries and cultures education system as a means of interpreting and translating know cultures and analysis of the formal and nonformal school sys reflect history, culture, development, values, contemporary co future trends.

The 33-semester-hour program allows a selection from a varie cialization areas. Four courses are chosen from international ed parative education, selected topics in international education, experiences, and futurism. The 9-semester-hour subspecialty com major area of study and may be taken in any division of the comprehensive examination is required.

**Progress Management: Classroom and Clinic**

gram is planned to prepare special reading teachers, reading clinicians, consultants, and reading supervisors. The program develops compe- in the foundations of reading instruction, classroom and individual is and treatment, and specialized knowledge areas reflecting the s career interests. This enables students to meet the professional ds for reading specialists as specified by the International Reading ion. Theory and practice are carefully integrated in classroom courses racticums that are based primarily in the Reading Center, a multidis- y clinical center located in the School of Education and Human ment.

3-semester-hour program includes courses in foundations of reading ment, diagnostic teaching of reading (K–6), clinical study of reading s, and assessment of cognitive functioning. Depending on a student's nterests, courses are taken in reading in the content areas at the ry level, cognitive models and instruction, the organization and admin- of reading programs, or severe learning disabilities in reading.

**Education**

r master's programs in special education provide core and specialty and field experiences designed to prepare highly competent and ed professionals for a broad range of educational and leadership roles eld of special education and related services.

**Childhood Special Education**

gram is designed to provide students with insight and knowledge in s of the development of young exceptional children, handicapping ns of early childhood, identification and assessment procedures in ldhood special education, clinical teaching of developmentally dis- ung children, and alternative models of service to the developmentally young child. This two-pronged program prepares teachers of develop- disabled young children (a direct-service role) and early childhood ducation strategists (a consultant role). Admission requirements differ role.

9-semester-hour program includes courses in developmental and ssessment, language development, developmental needs, multidis- theory, professional roles, counseling intervention skills, and behav- gement. A seminar, practicum, and internship are required.

**Special Education**

ram is designed to prepare professional educators to serve the special needs of developmentally disabled infants and toddlers in either a or strategist role. The course of studies also prepares students to dministrative, consultative, and research roles in health care, human nd educational agencies serving the needs of special education infants ers. Internships in specialization areas may include pediatric educa- ital-based assessment, early identification, infant stimulation, devel- follow-up, research, day care, and advocacy.

-semester-hour program includes courses in medical and genetic infant development, neurodevelopmental programming, parenting icapped child, technology for special educators, multidisciplinary d planning approaches, infant assessment, and the development of ecial-needs children. A practicum and internship are required.

### Special Education for Seriously Emotionally Disturbed Adolescents

This program prepares special educators to work as members of ciplinary teams in residential sites, extended day care centers, and sc serve seriously emotionally disturbed adolescents. Participants develo sional skills to assess problems, plan teaching strategies, create a th milieu, tap multiagency resources, counsel students and their fam build realistic learning and living expectations.

The 39-semester-hour program includes courses in developmental a of adolescents, psychoeducational characteristics of the seriously di disturbed adolescent, specialized curriculum methods and intervention and interdisciplinary theory and planning approaches. Students are r participate in an internship and in course work or clinical experien Psychiatry and Behavioral Sciences and Psychology Departments.

### Transitional Special Education

This program is designed to train those who help youth and adults wi needs to make the transition from school to independent living and ment. The program requires at least 39 semester hours of graduate c and field experience, although the total number of hours will vary on the certification options selected by the student. The followin specialization are offered: secondary and vocational programming tive vocational evaluation, corrections, school-based vocational learning disabilities, and community living and supportive work.

### Supervision and Human Relations

This program is designed primarily to prepare teachers and other e personnel for increased responsibility in teaching and for adminis supervisory positions. The program offerings lead toward certi administrative and supervisory positions in most school jurisdict courses relate to general supervisory principles and responsibilit also of interest to educators in non-school educational and hum agencies.

The 33-semester-hour program includes courses in the foun curriculum development, human relations in educational manage vision of instruction, and supervision in the elementary and secon Appropriate elective courses, selected with the approval of a facu allow students to increase knowledge and skills in teaching conte in other humanistic and behavioral disciplines related to edu supervision.

### Tourism Development and Travel Administration

This program is designed to prepare persons to enter and advance sional career in travel and tourism. An internationally oriented pr concerned with the professional and research aspects of travel and t program enables the student to develop competencies needed for a travel and tourism field, with possible specialization in marketin management administration; data processing and quantitative skills; tions and public relations; public policy and administration; histo and national resource development; and travel industry operations.

At least 36 semester hours are required, including a thesis and a sive examination. In addition to 12 semester hours from one or component concentrations, the required courses cover tourism de

ng for tourism, and economic, social, cultural, and ecological aspects of
n. A 39-semester-hour nonthesis program is available; the comprehen-
xamination may be waived.

NCE REQUIREMENTS FOR THE MASTER OF ARTS IN EDUCATION
UMAN DEVELOPMENT

chool of Education and Human Development seeks applicants with
academic potential, high motivation, and aptitude to do graduate-level
Admission decisions are based on an evaluation of all material submitted
port of the application. The School requires official transcripts of all
us undergraduate and graduate course work and acceptable test scores
er the Graduate Record Examination or the Miller Analogies Test.
nterview in the office of the dean is required for applicants who live in
shington, D.C., metropolitan area; a letter of reference is required of all
pplicants.
ddition to these basic requirements, individual programs may require
al interviews, relevant professional experience, and other supporting
entation before a final decision on admission is made. Upon receipt of
plication to the individual School program, information on specific
ments will be sent to the applicant. The personal interview, professional
nce, and supporting references provide important qualitative evidence
ing an applicant's academic potential and professional background.
admission review is based upon a comparison of qualifications among
e who apply, weighing both the School's general admissions criteria
gram-specific criteria.
ve decisions are made quickly for applicants who present uniformly
application credentials in all areas. In some cases, unusually strong
will offset comparatively weak factors and result in an offer of admis-
provisional status in the School. For a student to be admitted to full
cy from provisional status, he or she must earn grades of *B* or better in a
m of 9 semester hours of course work.

ED STANDING

ed standing is granted for approved courses taken at other accredited
ns, but a minimum of 24 semester hours must be completed at this
ty as a master's candidate.
ximum of 12 semester hours of advanced courses completed in this
ty in excess of the requirements for the bachelor's degree may be
toward the master's degree if the work fits in with the student's plan of
ation
ced standing is not granted for work completed five or more years
plication for admission or readmission to master's candidacy.

STUDY

of study leading to the degree of Master of Arts in Education and
Development requires a minimum of 33 hours of graduate credit.
rograms have additional credit hour requirements. The plan may, at
ent's option, include a thesis carrying six hours of graduate credit.
or not a student selects the thesis option, a minimum of 18 hours must
ourses planned primarily for graduate students (third-group courses).
um of 12 hours, not including the thesis, must be from courses offered
hool of Education and Human Development.
ns are planned initially in conference with an admission advisor in
ol of Education and Human Development and subsequently with a

designated advisor in the candidate's area of specialization. Programs a
on a candidate's interests and background; those related to teaching i
schools are designed around certification requirements of the state and
in which the candidate plans to teach.

All degree requirements must be completed within six years.

RESIDENCE

A candidate for the master's degree is required to complete satisfac
semester hours in residence.

SCHOLARSHIP

A quality-point index of 3.00 is required for graduation. Students wh
the grade of C in more than six semester hours are subject to sus
Students who receive a grade of F must confer with the dean before en
for further work.

THE THESIS

Students may elect a thesis option. The choice of the thesis subject
approved in writing by the student's advisor and filed in the office of
A statement of the School's standards for the thesis and printed
detailed regulations regarding the form and reproduction of the th
available in the office of the dean.

Payment of tuition for the thesis course entitles the candidate, d
period of registration, to the advice and direction of the member of th
under whom the thesis is to be written. In case a thesis is unfinished, a
time may be granted. The student must, however, be enrolled contin
the program. If the preparation of the thesis extends beyond the addit
granted, the student must register for the entire six hours of thesis
pay tuition as for a repeated course.

MASTER'S COMPREHENSIVE EXAMINATION

Candidates in master's programs requiring 33 semester hours may,
approval of the academic advisor, elect to take an additional three
hour course in lieu of a comprehensive examination. Candidates in
whose basic requirements exceed 36 semester hours may waive the
hensive examination with approval of the academic advisor. Candi
plan to take the examination must be registered in the semester it is
and must file a written application in the office of the School of Edu
Human Development no later than 30 days prior to the date of the ex
Comprehensive examinations are required of students in Admini
College Student Development Services, Reading Progress Manage
room and Clinic, and all programs in Human Kinetics and Leisure S
in Special Education.

WORK IN OTHER ACADEMIC DEPARTMENTS

For teachers interested in developing or strengthening their acade
tence, the master's program in Curriculum and Instruction encoura
semester hours of work in departments other than education. The
designed to meet the need of in-service teachers for additional
content area to qualify for advanced certification or to improve class
and may also be helpful to previously trained teachers planning to
profession. The major emphasis is upon strengthening both ac
professional competencies.

D MASTER'S DEGREE

ns seeking a second master's degree in the School of Education and n Development must complete all core and specialization requirements minimum residency requirement of 24 semester hours.

## EGREE OF EDUCATION SPECIALIST

ogram of advanced study leading to the degree of Education Specialist is dents with master's degrees in education who seek further professional ation for specific objectives.

program is under the supervision of the Advanced Graduate Faculty and ilable in the fields of administration, adult education, counseling, ulum, higher education, human resource development, and special ion.

### sions Requirements

llowing are required for entrance to an Education Specialist program: a of Arts in Education and Human Development or its equivalent, two f pertinent experience in an education or human development field, and ate scholastic average of at least 3.3 or an acceptable score on either the te Record Examination or Miller Analogies Test. Two letters of recom- tion, one from a professional supervisor and one from the most recent te faculty advisor, are required, along with a statement of professional Each applicant must be interviewed and recommended by a faculty in the major field.

### rship

rship requirements for the degree of Education Specialist are the same as or the degree of Master of Arts in Education and Human Development ove).

### ns of Study and Degree Requirements

ual programs are developed, through a plan of study worked out with a advisor, to fit the candidate's skills, interests, and career goals. A m of 30 semester hours beyond the requirements of the degree of of Arts in Education and Human Development is required. At least 21 f this work must be taken in residence at GWU. A maximum of five r years is allowed for completion of the program.

st 12 of the required 30 hours must be in appropriate graduate courses ation selected from the following areas: (1) foundations and cognate 2) background and general principles of the field of study, and (3) an specialization. A graduate-level research methods course must be d in the program if it was not completed in previous graduate work.

### prehensive Examination

ful completion of a six-hour written examination and/or an oral tion, at the option of the major field advisor, is required.

## GREE OF DOCTOR OF EDUCATION

ool of Education and Human Development offers programs of advanced ading to the degree of Doctor of Education. These programs, which are e supervision of the Advanced Graduate Faculty, provide major fields

of study in curriculum and instruction, special education, counsel human development, educational administration and policy studies, resource development and adult education, and higher education. Su fields are available in administration, administration of higher educatio education, college student development, counseling, curriculum, ele education, higher education, human development, human resource d ment, international education, program evaluation, reading, secondary tion, special education, supervision, teacher education, and tourism d ment and travel administration. With the approval of a student's planning committee, course work may be taken in other departmen University. All programs require study of interrelated areas of educatio doctoral dissertation in the major field of study.

All doctoral programs are designed to accommodate the needs of professionals who must pursue their studies on a part-time basis. graduate courses, with few exceptions, are offered in the late after evening. In some programs, selected courses may be taken at off locations.

### Admission

The applicant must have adequate preparation for advanced study, i graduate work in fields prerequisite to his or her objective and equi that required for the degree of Master of Arts in Education and Development at this University, at least three years of successful educational experience, acceptable personal qualities, a capacity for scholarship and effective leadership, and a graduate scholastic aver least 3.3 and an acceptable score on the Graduate Record Examinat Miller Analogies Test. Students whose native language is not Eng submit scores on the Test of English as a Foreign Language. Intervi program faculty and two letters of recommendation, one from a pro supervisor and one from the most recent graduate faculty advisor, are along with a statement of professional goals. Students with a master's a field other than education may be considered for doctoral study pro the degree and previous experience are judged relevant by the ma program faculty.

The applicant is encouraged to schedule an interview with the dean, who will discuss the applicant's needs in relation to the resources, explain the required procedures and standards, and applicant through the admissions process. All applicants must co interview with faculty members in the major field. Candidates me initial standards are admitted to precandidacy for the degree.

### PRECANDIDACY

In the precandidacy period a minimum of nine semester hours of co in the program, including requirements specified by the Advanced Faculty, must be completed. Full-time students must complete within the first 18 semester hours; part-time students must complete three semesters of admission to precandidacy. Application for full will then be decided on the basis of the quality of scholarsh precandidacy period, the recommendations of instructors, a detailed the balance of the program, and a qualifying examination.

### Plan of Study

In general, from two to three years of full-time study beyond the mast

lucation, or the equivalent in part-time study, are required. Programs are idually planned.

ch program is divided into two parts. The first consists of studies ratory to taking major and supporting field comprehensive examinations required research tool studies. The second consists of the doctoral rtation and the final oral examination.

on admission to doctoral candidacy, the student is assigned to a program ing committee of three faculty members, one of whom must be from de the major field of study. Students who have completed the comprehen- examinations must register for a minimum of 6 semester hours of rtation Research per semester until 12 hours have been completed and a mum of 3 semester hours per semester thereafter, to a total of 24 semester , until the satisfactory completion of the final oral examination.

REHENSIVE EXAMINATIONS

successful completion of a minimum of 9 semester hours of course work, tudent must pass a three-hour qualifying examination, the content of h includes questions from both the major field of study and foundations of ation. Supporting field examinations are three-hour written examinations; uired, they are taken before the integrative comprehensive examination. ourse work must be successfully completed prior to taking the integrative rehensive examination (the only exception is the Pre-Dissertation Semi- All courses, including the research tool requirement, must also be leted prior to the integrative comprehensive examination.The integrative rehensive examination is a written 12-hour examination, six hours on of two successive days. The candidate begins the second part of the am after the satisfactory completion of all examinations and the required ch tool field.

SSERTATION

sertation is required as evidence of ability to perform original scholarly ch and to interpret and present its results.

he beginning of the dissertation phase, the dean appoints a dissertation ittee, consisting of a chairperson (usually a major field advisor) and two onal faculty members. The candidate is required to submit a proposal for ssertation to this committee, which determines its acceptability. The ation is completed under the guidance of the chairperson, with the of the other members of the dissertation committee.

ater than the date specified in the calendar, the candidate must submit to an three complete copies of the dissertation and two copies of an abstract ographical sketch for inclusion in the announcement of the examination reproduction by University Microfilms, Inc. Printed copies of detailed ions regarding the form and reproduction of the dissertation, prepara- the abstract, and services offered by University Microfilms, Inc., are le in the office of the dean. The successful candidate for the doctorate is d, before receiving the degree, to pay fees that are applied toward the e of binding library copies of the dissertation, printing the Announce- f the Final Examination, and the basic service rendered by University lms, Inc., and to sign a microfilm agreement.

AL EXAMINATION

he dissertation has approval of the dissertation chairman and at least er committee member, the candidate is recommended to the dean for l oral examination, which must be passed at least 30 days before the

degree is to be conferred. The examination is open to the publ
conducted by a committee of the faculty, appointed by the dean, supp
by at least two leaders in the candidate's field of study from ou
University. Candidates who successfully pass the oral examination a
mended for the degree by the faculty of the School of Education an
Development. Three final edited copies of the dissertation must be sub
the office of the dean within one month of the final oral examinatio
later than one month before the degree is to be conferred.

### Continuous Study and Residence

Students must be continuously enrolled in the School of Education an
Development, unless the dean or the Advanced Graduate Faculty gran
of absence. Failure to register each semester of the academic year may
lapse of candidacy. Subsequent readmission is subject to whate
conditions and regulations have been established by the Advanced
Faculty.

All required examinations must be completed within five years of th
admission, and the entire program must be completed within eig
regardless of full-time or part-time study. All candidates must satisf
three options for intensive study. Information concerning these plan
provided by the assistant dean upon request by the candidate.

## SPECIAL PROGRAMS AND SERVICES

### Teacher Certification Curricula

The School of Education and Human Development provides indi
planned programs for liberal arts graduates with appropriate degre
accredited institutions who wish to prepare for teaching. Those
certification, but not wishing to work for a degree, may enroll in a cert
program if they meet the admission, scholarship, and personality requi
of degree candidates. The School also provides a wide range of co
interest to teachers who wish to renew licenses.

### Reading Center (See page 52)

### Off-Campus Degree Programs

The School of Education and Human Development offers off-campus p
leading to the Master of Arts in Education and Human Developme
fields of adult education, curriculum and instruction, higher education,
resource development, early childhood special education, transitiona
education, and supervision and human relations; and the Education S
in the fields of administration and higher education. The prog
administered through the Division of Continuing Education.

## OOL OF GOVERNMENT AND BUSINESS ADMINISTRATION

N.M. Loeser
iate Dean C.W. Washington
ant Deans M.S. Katzman, P.B. Malone III

### ULTY 1987–88

ssors W.C. Adams, F. Amling, H.G. Askari, W.H. Becker, P.S. Birnbaum, Black, D.S. Brown *(Emeritus)*, B. Burdetsky, B.L. Catron, S.R. Chitwood, Darr, H.J. Davis, S.F. Divita, S.W. Dunn *(Distinguished Visiting)*, R.F. er, R.B. Eastin, A. El-Ansary, R.W. Eldridge, M.H. Firestone, E.H. Forman, Frame, S.S. Fuller, M.G. Gallagher, F. Ghadar, S. Greene, P.D. Grub, W.E. lal, W.C. Handorf, M.M. Harmon, J. Hilmy, J. Harvey, F.C. Kurtz, G.P. ter, J. Lobuts, Jr., N.M. Loeser, A.J. Mastro, D.C. McGrath, Jr., J.E. Ott, H.R. e *(Emeritus)*, C.M. Paik, Y.S. Park, L.G. Pawlson, P.N. Reeves, F.W. Segel, N. Sherman, R.G. Shouldice, W. Sommers *(Emeritus)*, R.McK.F. Southby, Spain *(Visiting)*, S.J. Tolchin, S. Umpleby, P.B. Vaill, C.W. Washington, J. Winstead *(Visiting)*

ciate Professors T.M. Barnhill, J.H. Carson, J.M. Cary, N.G. Cohen, J.W. ok *(Visiting)*, J.P. Coyne, G.E. Crum, R.G. Donnelly, S.R. Eastaugh, D.E. le, L. Graff, W. Greenberg, J.A.R. Guertin *(Visiting)*, W.W. Hardgrave, R.L. lland, D.L. Infeld, J.F. Kasle, M.S. Katzman, J.E. Kee, D.J. Lenn, J. ebowitz, M.L. Liebrenz-Himes, R.W. Longstreth, L.M. Maddox, P.B. Ma- he III, C.J. McSwain, T.J. Nagy, K.E. Newcomer, J.H. Perry, F. Robles, J.M. chlis, D.R. Sheldon, J.B. Thurman, W.G. Wells, Jr., W.J. Wenker, E.K. nslow, P.W. Wirtz, D.L. Zalkind

stant Professors S.N. Cory *(Visiting)*, E.J. Englander, B.C. Horn, S.B. nkins, D.R. Kane, Z. Karake *(Visiting)*, T.E. McCue, L.C. Moersen, P.S. yser, C.C. Shepherd, Jr., L.G. Singleton, D.B. Smith, K.E. Smith, R. Soyer, L. Sudweeks *(Visiting)*, W.F. Thomas

uctor P.R. Witmer

### mittees*

N'S COUNCIL

Cary, E.J. Englander, J.F. Kasle *(Chair)*, A.J. Mastro, D.C. McGrath, Snouldice

MITTEE ON CURRICULUM AND PROGRAMS

Catron, K.J. Darr, S.S. Fuller, M.J. Gallagher, W. Halal, J.H. Perry, Washington *(Chair)*

MITTEE ON DOCTORAL STUDIES

Eastaugh, D.E. Gale, W.W. Hardgrave, M.M. Harmon *(Chair)*, C.J. wain, C.M. Paik, F. Robles

MITTEE ON GRADUATE STUDIES

reene, M.M. Harmon, Z. Karake, D. Kennedy, P.B. Malone *(Chair)*, Reeves, D.B. Smith, W.F. Thomas, M. Vann

MITTEE ON UNDERGRADUATE STUDIES

Katzman *(Chair)*, D. Kennedy, J. Liebowitz, C. Mallon-Harris, C.C. herd, L.G. Singleton, G.W.G. Stoner, M. Vann

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*Dean and Associate Dean of the School are *ex officio* members of all committees.

## INTRODUCTION

Organized as the School of Government in 1928, the School of Governm
Business Administration has been responsible for over half a century
professional development of individuals assuming membership and lea
roles in society. The School comprises six departments—Accountanc
ness Administration, Health Services Administration, Management
Public Administration, and Urban and Regional Planning. The u
multidisciplinary approach in educational programming helps prep
the generalist and specialist for professional careers in today's
organizational society.

### Purposes

The School of Government and Business Administration is dedi
academic excellence through the study, teaching, and research of man
and policy in the public and private sectors, both within the United St
internationally.

Over a span of half a century, the School of Government and
Administration has developed a learning community in which mature
uals can prepare themselves to assume membership and leadership
society. The School practices a multidisciplinary approach with flexi
educational programming in the belief that such is essential to dealing
complexities of today's organizational society. The School offers prepa
both the generalist and the specialist for professional careers and
improve the quality and character of the individual as citizen, professi
scholar as well.

More specifically, the purposes of the School are

1. To prepare its graduates for positions in the management of
organizations.
2. To provide a broad and fundamental education as preparation
tions carrying management and leadership responsibilities.
3. To provide specialized educational opportunities as prepara
career positions in professional disciplines or functional areas.
4. To explore in all their forms, through education and research, the
interactions, and interdependencies of disciplines and institution
public and private sectors, both nationally and internationally.
5. To make available the School's resources to business, health, go
community, and other organizations in both the metropolitan area
larger community.
6. To foster understanding and advancement of knowledge and s
world community through research, education, and scholarly excha
governments, institutions, and organizations engaged in the solution o
tional trade and investment problems and in the management
settlements.

### Academic Status

The School of Government and Business Administration has maint
membership in the Middle Atlantic Association of Colleges of
Administration since 1961. It joined the Council on Graduate Edu
Public Administration in 1966. In 1968, the School became a mem
American Assembly of Collegiate Schools of Business, and the und
and master's programs in business administration are accredite
Assembly. The program in health services administration is accredit

iting Commission on Education for Health Services Administration. The of Urban and Regional Planning degree program is recognized by the an Planning Association. The School is a member of the National ition of Schools of Public Affairs and Administration, and its Master of Administration degree program is accredited by the NASPAA Commis- Peer Review and Accreditation.

**hips**

hool of Government and Business Administration has several under- e and graduate fellowships available to its students, including the hr Research Fellowships in International Business, the Business Ad- ation Departmental Fellowships, the Government Intern Scholarship a, Health Services Administration Fellowships, Ernst and Whinney to Doctoral Candidates in Accounting, the National Association of ing Management Fellowship, the Rita H. Keller Scholarships, the Rite Foundation Fellowships, the Wolcott Foundation Scholarships, ority Students Fellowships, the Hyundai Foundation Scholarships in ional business; information systems; logistics, operations, and materi- agement; and science, technology, and innovation; and the SGBA l Fellowship.

**ATIONS**

nissions; Registration; Fees and Financial Regulations; Regulations.

**nce**

nt may not attend classes until registration is completed. The student is ponsible for all of the work of the courses in which registered, and all s must be excused by the instructor in charge before provision is made tudent to make up the work missed. A student suspended for any cause attend classes at GWU during the period of suspension.

**wal**

wal from a course or from the University without academic penalty is d during the first five weeks after registration for the fall or spring . Withdrawal after this period is permitted only in unusual circum- and requires certification by the instructors of courses for which the is registered that the student is doing passing work (see Withdrawal, egulations).

**Courses**

may not be added after the first two weeks of classes in any semester.

**lent Study Plan**

senior, or graduate student of demonstrated capacity, with a special n the subject matter of a course, may be permitted to undertake study e personal direction of an instructor, in accordance with the rules of opriate department. Credit under this plan is limited to the specific urs normally allowed when a course is taken on a class basis.

**rrect English**

lent whose written or spoken English in any course is unsatisfactory eported by the instructor to the dean. The dean may assign supplemen-

tary work, without academic credit, varying in amount with the nee
student. If the work prescribed is equivalent to a course, the regular t
is charged. The granting of a degree may be delayed for failure to mak
deficiency in English to the satisfaction of the dean.

### Students from Other Schools Within the University

Degree candidates from other schools of the University cannot registe
than 12 hours of credit in courses from the Bachelor of Accountancy,
Accountancy, Master of Taxation, Bachelor of Business Administ
Master of Business Administration degree programs. Typically, a ma
6 hours of credit is permitted in courses from the Bachelor of Acc
program, unless an advisor recommends an additional 3 credit hou

### Common Body of Knowledge

Programs leading to the degrees of Bachelor of Accountancy, B
Business Administration, Master of Accountancy, Master of Tax
Master of Business Administration include the equivalent of at least
work in the following areas:

1. A background of the concepts, processes, and institutions in th
tion and marketing of goods and services and the financing of the
enterprise or other forms of organization.
2. A background of the economic and legal environment as it
profit and nonprofit organizations, along with ethical considerations
and political influences as they affect such organizations.
3. A basic understanding of the concepts and applications of a
quantitative methods, and information systems.
4. A study of organization theory and behavior and interpersonal
cations.
5. A study of administrative processes under conditions of u
including integrating analysis and policy determination at the overa
ment level.

## THE BACHELOR'S DEGREES

The School offers programs leading to the degrees of Bachelor of A
and Bachelor of Business Administration with fields of instruction
economics and public policy; finance; information processing; in
business; logistics, operations, and materials management; mark
personnel management.

## ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the
studies contemplated are required.

Requirements for admission to the freshman class include

1. An acceptable certificate of graduation from a U.S. second
showing at least 15 units,* which must include four years of Eng
two years of one foreign language; two years of science, pref
laboratory instruction; two years of social studies, one of wh
American history; and one year of college-preparatory mathem
introductory algebra.

* A unit represents a year's study in a secondary school subject, including in the
less than 120 sixty-minute periods, or the equivalent, of prepared classroom w

ernational students may be considered for admission with an equivalent
gn secondary certificate. A student presenting a U.S. secondary certificate
foreign equivalent must also show competence in the English language by
ng not less than 550 on the first taking of the TOEFL or 600 on the second
g. International students may be required to take an English proficiency
ination and may be required to enroll in a full-time program in English
e beginning studies in a degree program.

Standardized test scores submitted on College Board Achievement Tests
glish composition and mathematics and on the Scholastic Aptitude Test,
the American College Testing battery. (Normally, students with SAT
l scores below 450 or SAT math scores below 500 will not be admitted.)
teria for admission include a strong high school record and a satisfactory
rmance on the College Board examinations. It is recommended that the
inations be taken in December or January. Scores on tests taken in the
r year may be submitted. Arrangements for tests are the responsibility of
pplicant and should be made with the College Board Admissions Testing
am, CN 6200, Princeton, N.J. 08541–6200, not less than one month before
ate of the test. In applying for the test, the applicant should specify that the
s be sent to the Office of Admissions, George Washington University,
ington, D.C. 20052.

erican College Testing battery scores are also accepted. The applicant
d request that these scores be sent to the Office of Admissions directly
the American College Testing Program, P.O. Box 168, Iowa City, Iowa
. It is recommended that the applicant take the tests in October of the
r year.

### ssion With Advanced Standing

rements for admission of students transferring from other regionally
dited colleges and universities and from other divisions of this University,
follows.

newly admitted student who plans to register in the School of Govern-
and Business Administration for the first time and whose native language
English must take an English as a Foreign Language placement test. A
nt failing to pass this examination will be required to complete success-
he appropriate English course or courses, and the assignment of credit for
reviously completed course at another institution will be held pending
letion of this requirement.

inarily, students who have accumulated no more than 30 semester hours
sferable relevant academic credit must have a minimum 2.00 cumulative
index and meet the freshman requirements. Students who have accumu-
31 to 90 transferable semester hours of relevant academic credit must
a 2.50 or higher cumulative grade index. Advanced standing may be
ed for properly certified courses taken at regionally accredited colleges or
sities for which the student received a grade of C or better, and may be
d toward a degree, provided they are comparable to the curricular
ements of the degree.

o case will more than 60 semester hours of advanced standing be granted
urse work completed at regionally accredited community or junior
es. These 60 hours may include credit granted for completed course work
lent to BAd 104 and Mgt 119. Other courses (one course per area up to a
um of three courses), comparable to this School's courses numbered
00, taken at an accredited community or junior college with an earned
of C or better, may be accepted to waive certain required courses. The

waiver of a required course does not entitle the student to any semeste credit and does not reduce the total number of credits that must be c to earn the degree.

Although a grade of *D* is not acceptable for transfer of credit, the co be used to waive a comparable curricular requirement. Credits earned grade may not, however, be counted toward the total number of semes required for the degree. Any course completed with a grade of *D* or be not be repeated for the purpose of earning degree credit. An exceptio rule is the freshman English composition requirement, Math 31 or 51 equivalents), and all accountancy courses. Any student earning a *D* courses at another institution may be required to repeat the course University.

The School reserves the right to refuse credit for transfer in whole o or to allow credit provisionally. No more than 3 credit hours per course accepted as transfer credit.

It is the responsibility of the student to have an official transcr directly from each institution formerly attended to the Office of Adm Rice Hall, George Washington University, Washington, D.C. 20052.

A student wishing to transfer into the School from another division University must submit a formal application of transfer to the O Admissions in Rice Hall.

Courses taken in another degree-granting division of this University applied toward a degree in this School, provided they are comparable curricular requirements of the degree. A maximum of 90 semester hours credit may be applied toward a degree program in this School. Howeve case will credit for more than 15 semester hours of undergraduate cour taken at this University in nondegree status be allowed toward meeting requirements in this School.

### Readmission

A student who withdraws, is suspended, or is otherwise absent authorization from the University for one semester or more must make application for readmission. If readmitted, the student is subject to and regulations in force at the time of return. If the student has attende more regionally accredited colleges or universities during absence University, complete official transcripts must be sent to the Office of sions from each institution attended.

The application fee is waived for a student applying for readmissi was registered as a degree candidate at the time of last registration University and has not since registered at another college or universit

## DEGREE REQUIREMENTS

### Academic Work Load

A full-time student not on probation may not ordinarily take more semester hours. A student employed more than 20 hours a week, who probation, may not take more than nine semester hours.

A full-time student whose overall quality-point index is 3.50 or hi take up to 18 semester hours. A student employed more than 20 hours whose index is 3.50 or higher, may take up to 12 semester hours.

A student who accepts employment after registration or at any time semester must report immediately to the dean so that the program adjusted if necessary.

ptions to these rules require the approval of the dean.
ndergraduate student on probation may take no more than 12 semester
of course work.

**rship Requirements**

lent must have the following to graduate: (1) an overall quality-point
of at least 2.00 and (2) a quality-point index in the field of instruction of
2.00. All courses that are acceptable for credit toward the bachelor's
s are to be included in the *overall quality-point index* calculation.
e courses in or out of the School of Government and Business Adminis-
cannot be used as substitutes for required courses in the calculation of
d *quality-point index*. Only required 100-level B.B.A. or B.Accy. courses
ld-related courses are used in the *field quality-point index* calculation.

HONOR LIST

mes of students who achieve a quality-point index of 3.50 or higher are
on the Dean's Honor List for that semester. Appearance on the list is
to (1) full-time students registered for a minimum of 12 semester hours
ded that the 12 hours are taken for a grade) and (2) part-time students
red for a minimum of 12 semester hours over a period of two consecutive
ters, which may include a summer term.

PLETE/AUTHORIZED WITHDRAWAL

ions under which the grades of *I* (Incomplete) or *W* (Authorized
rawal) may be assigned are described under Regulations.
grade of *I* must be changed by a date agreed on by the instructor and the
t but no later than the last day of the examination period for the fall or
semester immediately following the semester or summer session in
the grade of *I* is assigned. An Incomplete that is not changed within this
automatically becomes an *F*. In cases of well-documented extenuating
stances, an instructor and a student may jointly petition the dean for
nal time in which to complete the work of the course. Such petitions
be submitted within the same period. The grade of *I* cannot be changed
gistering for the course here or by taking its equivalent elsewhere.
grade of *Z* (Unauthorized Withdrawal) is assigned when students are
ed for a course they have not attended and in which they have done no
tual graded work. The grade of *Z* is not calculated in the overall and
quality-point indexes.

ION

nt whose quality-point index (either overall or in the major) falls below
er completing a minimum of 12 semester hours of study will be placed
bation. This probation extends over the period in which the student
s another 12 semester hours of work, which may include remedial
as prescribed.

SION

nt whose quality-point index (either overall or in the major) is 1.50 or
any semester or remains below 2.00 at the end of the probationary
ill be suspended. A student suspended for poor scholarship may apply
nission after the end of the fall or spring semester following the date of
on. To be considered for readmission, the student must submit
of remedial activity performed during the suspension period and

evidence of renewed potential ability to do college-level work. No a
standing will be assigned for academic work completed while the s
suspended, but the student may petition the Dean for consider
advanced standing after completing a minimum of 12 semester hours
work here and achieving a cumulative and field of instruction index
2.00.

A student readmitted after suspension is on probation and must m
current quality-point index of at least 2.50 for each 12 semester hour
undertaken until the cumulative and field index are at least 2.00. I
will the probationary period after readmission exceed 24 semester
study. A student suspended twice for poor scholarship will not be re

PASS/NO PASS OPTION

A junior or senior student who has a cumulative quality-point index
bette may, with the approval of the advisor and the dean, take one
sem ter and receive a grade of *P*, Pass, or *NP*, No Pass, which will be
on the student's transcript but will not be reflected in the quality-po
No student will be allowed to take more than four pass/no pass
student must sign up for such an option at registration. Under no circ
may a student change from pass/no pass status to graded status, or
after the last date to add a course (except in the case of a prerequisi
51). Required courses may not be taken on the pass/no pass basis.
student may not choose this option until the second semester of enr
the University.

**Residence**

A minimum of 30 semester hours, including at least 12 semeste
required B.B.A. or B.Accy. courses, must be completed while regist
School of Government and Business Administration. This requirem
to students transferring within the University as well as to students t
from other institutions. Unless special permission is granted by th
pursue work elsewhere, the work of the senior or final year must be
in the School of Government and Business Administration.

**Correspondence and Home-Study Courses**

Credit for correspondence or home-study courses is not acceptable
be applied toward a degree in this School.

**Earning Credit or Waiving Requirements by Examination**

A student may earn credit up to a maximum of 30 semester hour
curricular requirements by performing satisfactorily on the followi

*College-Level Examination Program (CLEP)*—See Admissions
information on the CLEP tests. CLEP tests in Introduction to
Commercial Law, and Data Processing are limited to 3 credits each
standing. CLEP tests in college algebra/trigonometry, English comp
more advanced courses in accounting and business administrati
accepted for advanced standing. Matriculated students who wish
credit for CLEP General and Subject Examinations must receive pri
through petition, of their advisor and the dean.

*Advanced Placement Tests*—See Admissions.

*Achievement Tests*—See Admissions.

*Examinations for Waiving Curriculum Requirements*—The Sch
ernment and Business Administration does not administer waiv

owever, certain arts and sciences courses may be waived, and in some s credit may be assigned, by satisfactorily passing a special departmen- ination approved by the department or designated advisor. Requests to examination should be made to the designated advisor and the fee paid at the Office of the Cashier before the date set for the tion. See pages 70–71 for more information.

**ive Education Program**

ool of Government and Business Administration has entered into Cooperative Education agreements with U.S. government agencies in ington, D.C., area. Students who are selected to participate in these s generally work in paid employment for one semester and attend he next semester. Since these programs are currently designed for nd seniors, program length is for one- and two-year periods. The areas are closely integrated with the student's field of instruction (e.g., g, finance, personnel, etc.). Interested students should contact the of the School's Office of Experiential Learning and Internships or the n of the Department of Business Administration for specific guidance ils.

**ent Study Plan**

t of demonstrated capacity in the junior or senior year may earn up to hours through independent study under the direction of a member of ty of the school.

## CHELOR OF ACCOUNTANCY

cipal objective of the Bachelor of Accountancy degree is preparation ofessional career in accounting. Although professional preparation specialization in the acquisition of accounting knowledge in the junior or years, attainment of the objectives requires a general education in humanities, social sciences, mathematics, and sciences in the first two undergraduate study. In addition, a common body of knowledge in administration is necessary during the junior and senior years, with eference to the needs of the student in the accounting program. An al objective is the preparation of students for a fifth-year or Master of ancy program that is intended to meet the academic needs of students rofessional accounting careers in the public or private sector, which demand high entry-level academic achievement.

undred twenty semester hours are required for graduation. Courses taken in accordance with the academic status of the student (i.e., , sophomore, junior, senior) and the course prerequisites.

3, 6, 9, and 10 may not be used for credit toward the Bachelor of ancy.

**m for the Pre-Accountancy Program***

N YEAR

| | | Semester Hours |
|---|---|---|
| Economics: | Econ 1–2 | 6 |
| English: | Engl 9 or 10, 11 | 6 |
| Mathematics: | Math 31–32 or 51–52 | 6 |

epted in the Bachelor of Accountancy program a cumulative quality point index of ter is required at the start of the junior year.

| | |
|---|---|
| Science: | BiSc 3–4; Chem 3–4; Geol 1–2; or Phys 9–10 |
| Social Sciences: | Geog 1, 2; PSc 2; Soc 1 |
| | Total |

SOPHOMORE YEAR

| | |
|---|---|
| Accountancy: | Accy 51–52 |
| Economics: | Econ 121 |
| Social Sciences: | Psyc 1 and 8; Phil 45 or 50 and 135 |
| Statistics: | Stat 51 |
| Communication: | Comm 111 |
| Computer Studies: | Mgt 58 |
| | Total |

**Curriculum for the Accountancy Program**

JUNIOR YEAR

| | |
|---|---|
| Accy 101: | Cost and Budgetary Control |
| Accy 121: | Intermediate Accounting |
| Accy 151: | Business Law for Accountants I |
| Accy 152: | Business Law for Accountants II or |
| Accy 162: | Federal Income Taxation of Corporations |
| Accy 161: | Federal Income Taxation: Individuals |
| Accy 191: | Advanced Accounting |
| BAd 120: | Business Finance |
| BAd 140: | Basic Marketing Management |
| BAd 191: | Fundamentals of Management |
| Engl 100: | Written Communications in Accounting |
| | Total |

SENIOR YEAR

| | |
|---|---|
| Accy 132: | Accounting Theory |
| Accy 171: | Auditing |
| Accy 181: | Accounting Systems |
| BAd 101: | The Business Environment |
| BAd 110: | Personnel Management or |
| Mgt 107: | Fundamentals of Behavioral Science |
| BAd 160: | Introduction to International Business or |
| BAd 166: | International Marketing Management or |
| BAd 171: | International Business Finance |
| BAd 188: | Managing Production/Operations |
| BAd 197: | Strategy Formulation and Implementation |
| Stat 103: | Sampling in Accounting |
| Elective: | Chosen from Columbian College or the School of ernment and Business Administration |
| | Total |

## THE BACHELOR OF BUSINESS ADMINISTRATION

One hundred twenty semester hours of course work are required tion. To be recommended by the Faculty for graduation, can required to complete, in addition to the appropriate freshman and work, a minimum of 60 semester hours of course work in the juni years selected from one of the fields of instruction offered by Courses must be taken in accordance with the academic status of (i.e., freshman, sophomore, junior, senior) and the course prereq

instruction must be selected no later than the first semester of the junior
lath 3, 6, 9, and 10 may not be used for credit toward the B.B.A. degree.
ond semester of a first-year language course that was previously studied
school may be taken as a sophomore elective, provided the student
via test) at this level.

**lum for the First Two Years for**
**helor of Business Administration Students**

AN YEAR

| | | |
|---|---|---|
| Mathematics: | Math 31–32 or 51–52 | 6 |
| Economics: | Econ 1–2 | 6 |
| English: | Engl 9 or 10, 11 | 6 |
| *Science: | BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; or Phys 1–2 or 9–10 | 6 |
| ocial Sciences: | AmCv 71–72; Anth 1–2; Geog 1, 2, or 3; Hist 39–40 or 71–72; PSc 1, 2; or Soc 1, 2 | 6 |
| | Total | 30 |

ORE YEAR

| | | |
|---|---|---|
| Accountancy: | Accy 51–52 | 6 |
| Business dministration: | BAd 51 | 3 |
| *Humanities: | Art 31–32 or 71–72; Chin 3–4; Clas 71–72; Engl 51–52, 61–62, 71–72, or 191–92; Fren 2–3 or 51–52; Ger 3–4, 9–10, or 51–52; Ital 2–3; Mus 3, 4; Phil 45, 50, or 71; Rel 1, 2, 9, 10, 21, 23, or 91; Slav 3–4, 5–6, or 91–92; Span 2–3 or 51–52; or Comm 1, 2, or 111 or SpHr 11 | 6 |
| Management Science: | Mgt 58 | 3 |
| cial Sciences: | Psyc 1, 8 | 6 |
| †Elective: | Courses other than accountancy, business administration, management science, or economics | 3 |
| Statistics: | Stat 51 | 3 |
| | Total | 30 |

**um for B.B.A. Fields of Instruction**

demic programs comprising these fields of instruction are designed to
the broad foundation required for eventual leadership in either
s or governmental administration. Each field of instruction consists of
ster hours of required general business administration courses and 15
required field-related courses. Twelve hours of electives, normally
d courses in liberal arts subjects, are required in each field but are not
l in the calculation of the field quality-point index.

EAR

| | | |
|---|---|---|
| uired General .B.A. Courses Accountancy: | One course selected in consultation with the advisor from Accy 101, 111, 121, 161 | 3 |

ual circumstances and with the approval of an advisor, students may petition the
pproval of another appropriate combination of courses.
d to appropriate 100-level courses. (Courses in exercise and sport activities do not
requirement.)

| | |
|---|---|
| BAd 110: | Personnel Management |
| BAd 120: | Business Finance |
| BAd 140: | Basic Marketing Management |
| BAd 191: | Fundamentals of Management |
| Econ 121: | Money and Banking |
| Field-Related Courses: | Six semester hours selected from among courses in chosen field of instruction |
| †Elective: | To be selected in consultation with the advisor |
| | Total |

SENIOR YEAR

| | |
|---|---|
| Required General B.B.A. Courses | |
| BAd 101: | The Business Environment |
| BAd 104: | Commercial Law |
| BAd 188: | Managing Production/Operations |
| BAd 197: | Strategy Formulation and Implementation |
| ‡Psyc 144: | Personnel and Industrial Psychology **or** |
| Mgt 107: | Fundamentals of Behavioral Science |
| Field-Related Courses: | Nine semester hours selected from among courses in chosen field of instruction |
| †Elective: | To be selected in consultation with the advisor |
| | Total |

The field of instruction must be selected no later than the first semes junior year. The student should contact the office of Academic Scheduling to declare a field of instruction and receive the nam designated faculty advisor. Fields of instruction are described belo

### 1. Business Economics and Public Policy

This field is directed toward developing understanding and skills applicabl variety of positions in business and government. Students will supplement work in business and economics with additional courses in economics, polit and government–business relations. The social, legal, political, and econo ment of business and the micro- and macroeconomic foundations of programs and regulatory activity will be studied to establish a basis for de evaluating effective business responses. The program is concerned with th business-government dialogue on effective and equitable relations betwe sectors of the economy.

The following courses provide a basic academic foundation in the field economics and public policy. An asterisk indicates that the course is requ field of instruction.

| | |
|---|---|
| BAd 117 | Collective Bargaining |
| BAd 171 | International Business Finance |
| *Econ 101 | Intermediate Microeconomic Theory |
| *Econ 102 | Intermediate Macroeconomic Theory |
| Econ 136 | Natural Resources and Environmental Economics |
| Econ 158 | Industrial Organization |
| Econ 159 | Government Regulation of the Economy |
| Econ 161 | Public Finance I |
| Econ 162 | Public Finance II |

† Restricted to appropriate 100-level courses in the liberal arts or in travel a approved by the advisor.
‡ Students in marketing should complete BAd 142, Consumer Behavior, requirement.

Econ 181–82 International Economics
PSc 116 The American Presidency
PSc 117 Public Administration and Bureaucratic Politics
PSc 118 Legislative Process
PAd 125 Managing Public Policy

e

helps students develop the skills required for entry-level employment in
ss, financial institutions, and the public sector. Corporations employ entry-
ce specialists for cash, credit, or inventory analysis or management and for
nk relations and capital budgeting. Financial institutions offer opportunities
evel finance specialists to analyze specific securities and to assist in loan
he government sector looks to finance students as potential financial analysts.
graduate B.B.A. degree with a finance field also provides an excellent
for graduate academic programs, especially the study of law.
wing courses provide a basic academic foundation in the field of finance. An
dicates that the course is required for the field of instruction.

Accy 111 Financial Statement Analysis **or**
Accy 121 Intermediate Accounting
*BAd 123 Investment and Portfolio Management
*BAd 124 Advanced Financial Management
BAd 130 Working Capital Management
BAd 132 Real Estate Investment **or**
BAd 133 Fundamentals of Insurance and Risk Management
BAd 135 Capital Formation
BAd 171 International Business Finance

tion Processing

king this field are recruited by organizations in both the public and private
positions as programmer analysts and systems designers. These entry-level
ad to careers in the marketing of computer hardware and software, systems
and management. Medium to large organizations are currently expanding
ce on computer systems, and with the development of inexpensive but
ini- and microcomputers, thousands of smaller organizations are finding
o be cost effective as well.
will supplement the basic skills learned in the B.B.A. curriculum with
nned to provide a firm foundation in the use of the computer as a tool
nformation problems in organizations. These courses relate ongoing, real-
ications of computers to the functional areas of business and government
ns.

wing courses provide a basic academic foundation in the field of information
An asterisk indicates that the course is required for the field of instruction.

†CSci 157 Assembly Language Programming of Large System Computers
†CSci 158 Algorithmic Methods
*Mgt 119 Computer Programming for Information Systems
*Mgt 120 Information Systems Development I
*Mgt 121 Information Systems Development II
*Mgt 122 Special Studies in Information Systems
Stat 130 Computer Programming
Stat 131 Data Structures

onal Business

ovides the basic academic foundations for entry-level positions in interna-
ess, particularly in multinational corporations, international banks, and
agencies. Such organizations include the Departments of Commerce, State,

ool of Engineering and Applied Science *Bulletin*.

and Treasury, plus international institutions such as the Export-Import Bank, and Overseas Private Investment Corporation. Students in this field ar to include two years of a modern foreign language in their preparatory bac

The following courses provide a basic academic foundation in the field of business. An asterisk indicates that the course is required for the field of

| | |
|---|---|
| BAd 123 | Investment and Portfolio Management |
| BAd 135 | Capital Formation |
| BAd 143 | Marketing Research |
| BAd 148 | Advertising |
| *BAd 160 | Introduction to International Business |
| *BAd 166 | International Marketing Management |
| BAd 168 | Foreign Market Analysis |
| *BAd 171 | International Business Finance |
| BAd 173 | International Banking |
| BAd 175 | International Monetary and Financial Issues |
| Econ 181 | International Economics |
| T&T 104 | Introduction to Travel and Tourism |

### 5. Logistics, Operations, and Materials Management

Students in this field will become equipped to contribute to the national ef economy, efficiency, and innovative competitive behavior for the Americ Many positions in industry and government that deal with material requirements, rates of consumption, acquisition, mobility, maintenance, assurance require the skills learned in this field. The field is designed to pro for entry-level positions performing the activities necessary to plan and co of material through the productive system and the external sourcing of r and services.

Graduates of the program will be prepared for career positions in industry, and consulting firms in such functional management areas as con tration, purchasing, materials and logistics, maintenance, quality assura requirements, project administration, price analysis, and contract admin support work.

The following courses provide the foundation for effective functioning logistics, operations, and materials management. An asterisk indicates the required for the field of instruction.

| | |
|---|---|
| *BAd 180 | Materials and Purchasing Management |
| BAd 181 | Management of Public Acquisitions |
| BAd 182 | Transportation Management |
| *BAd 183 | Logistics Management |
| *BAd 184 | Contract Management |

### 6. Marketing

This field has the objectives of (1) developing a conceptual understand and changing environment and its effects on marketing activities and understanding the dynamics of buyer behavior, (3) providing the sk demand, market segments, and cost–volume profit relationships of marke (4) enhancing abilities in written and verbal communications, and (5) de in formulating and implementing comprehensive marketing plans.

Typical entry-level positions for students with a marketing field a account executives, marketing research project managers, retail assista sales representatives for consumer or industrial products firms. Students backgrounds also have obtained positions in physical distribution, pe wholesale firms, and a variety of governmental and nonprofit organizatio

The following courses provide a basic academic foundation in the field An asterisk indicates that the course is required for the field of instruct

† BAd 142 cannot be used as a field of instruction course.

*BAd 143 Marketing Research
BAd 148 Advertising
BAd 149 Advanced Advertising Campaigns
*BAd 150 Salesmanship and Sales Management
BAd 152 Retailing Management
*BAd 159 Marketing: Strategic Planning
BAd 160 Introduction to International Business
BAd 166 International Marketing Management
BAd 180 Materials and Purchasing Management
BAd 182 Transportation Management
BAd 183 Logistics Management
Jour 145 Principles and Problems of Public Relations
Stat 105 Statistics in the Behavioral Sciences
Mgt 119 Computer Programming for Information Systems

### nnel Management

is concerned with all aspects of the employment of human resources in organizations. Entry-level career opportunities are in such fields as personnel ent, employee relations, collective bargaining, and manpower utilization. Since focuses on the management of human resources in a general sense, it also the student for responsibilities associated with general management and p.

owing courses provide a basic academic foundation in the field of personnel ent. An asterisk indicates that the course is required for the field of instruction.

*BAd 115 Leadership in Personnel Management
*BAd 117 Collective Bargaining
Jour 145 Principles and Problems of Public Relations
Psyc 129 Theories of Personality
Psyc 131 Psychological Tests
Comm 121 Small Group Communication

### y Field of Study

lary field of study in business administration is available in the School rnment and Business Administration. See the brochure *Secondary* Study, available in the office of the dean or from the Vice President for c Affairs.

## STER'S DEGREES

### CE REQUIREMENTS

nsidered for admission, applicants must present a bachelor's degree gionally accredited college or university. Application is made directly the Office of Enrollment Development and Admissions, School of ent and Business Administration. Admission to master's programs is mpetitive. Previous academic history, performance on the applicable examination, letters of reference, motivation and aptitude to do graduwork, and professional experience are all taken into consideration.
ants for admission to programs leading to the degrees of Master of ncy, Master of Taxation, and Master of Business Administration must cores on the Graduate Management Admission Test; applicants for to programs leading to the degrees of Master of Health Services ration and Master of Urban and Regional Planning must submit scores aduate Management Admission Test or the Graduate Record Examinaicants for admission to programs leading to the degree of Master of

Public Administration, Master of Association Management, and Science in Information Systems Technology must submit scores on ate Record Examination. It is the responsibility of the applica arrangements for the required test with the Educational Testi Princeton, N.J. 08541. Correspondence concerning the Graduate M Admission Test should be addressed to Box 966; concerning th Record Examination, to Box 955. Test scores that are more than fiv are not accepted for admissions review.

International students must submit scores for the Test of English a Language (TOEFL), with a total score of not less than 550. No stud considered for admission without this minimum score. Internation may be required to take an English proficiency examination in addi TOEFL and may be required to enroll in a full-time program in Eng beginning studies in a degree program.

*Transfer Within the School*—Currently enrolled students wishing from one graduate degree program and/or field of instruction to anot the School must complete an Application for Transfer through th Enrollment Development and Admissions. Applicants for transfer to requirements in effect at the time of transfer.

## GENERAL REQUIREMENTS

All students must complete the prescribed minimum number of sem of graduate course work. A maximum of one-quarter of the semest graduate course work required beyond First-Level (Common Body edge) or other required courses may be approved for transfer to the Government and Business Administration from the Division of Education, another degree-granting division of this University, regionally accredited college or university under the following condi course work must be approved as part of the student's program of must not have been applied to the completion of requirements fo degree, it must be at the graduate level, it must have been taken with years prior to acceptance into the program, and the student must hav a grade of *B* or better. This action must be approved by a petit designated faculty advisor and the dean. A transcript and descrip course work must be on file before the petition can be consider advanced standing be granted, the credit will count; however, earned in SGBA courses in the Departments of Public Administra Services Administration, and Urban and Regional Planning while in status will be used in calculating the cumulative quality-point ind

Extended programs, including undergraduate or graduate courses, may be assigned for an applicant whose undergraduate degr field other than the graduate program the student wishes to follow undergraduate record indicates a weakness in required backgroun

Master's degrees are awarded by vote of the Faculty on comple required course work, completion of an acceptable thesis (if one is required) or the equivalent work, and the passing of the Master's C sive Examination if required in the chosen degree or field of instru

Second-group courses (numbered 101–200) may be counted master's degree only when registration for graduate credit has bee by petition at the time of registration by the dean and the designa advisor. No work counted toward a bachelor's degree may be counte master's degree. However, a student who has completed the equi

n Body of Knowledge course with a grade of C or better as part of the
's degree program may request by petition a waiver of that course at the
level. A grade of C earned in Econ 217 and 218 at GWU while in degree
egree status is sufficient to waive that portion of the Common Body of
dge requirement.

ime students are expected to register for a minimum of 9 to a maximum
nester hours each semester. A graduate student who is employed more
hours a week may not take more than 6 semester hours. All work for a
degree must be completed in five years, unless an extension of time is
by the dean.

nts who expect to continue studies for a doctoral degree after receiving
ter's degree should ask for assistance in planning their programs of

edit is granted for work done in absentia or without formal instruction,
or hospital residency, supervised field experience, independent study,
thesis, which may be completed in absentia with the permission of the
ent, designated faculty advisor, or committee concerned.

## R'S COMPREHENSIVE EXAMINATION

Master's Comprehensive Examinations are required only in the Master
ce in Information Systems and Master of Urban and Regional Planning
s. Degree candidates should consult designated faculty advisors about
ations required and material to be covered. In writing the examinations,
s are expected to demonstrate what has been learned in course work
n the literature of the field. The examinations normally require four to
ours. Sections broadly cover the various fields that the candidate has
d.

inations are generally scheduled in the fall and spring semesters and
be taken during the last semester of course registration or shortly after
tion of prescribed course work.
itten application is filed with the department supervising the student's
study at the time of registration for the semester in which the
ation is to be taken. Before applying, the student must have completed
ses in the program or be enrolled in the last semester and must have
d a 3.00 (B) average. After applying for the examination, a candidate
thdraw only by written notice to the department chairman.
ndidate who fails the examination should consult with the designated
about a subsequent course of action.

## ARSHIP REQUIREMENTS

or graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*,
lete; *IP*, Progress; *CR*, Credit; *W*, Authorized Withdrawal; and *Z*,
rized Withdrawal.
erage of *B* or better is required for the master's degree. The grade of *C* is
sidered as failing but must be balanced by a grade of *A* in a graduate
f equal status. A minimum quality-point index of 3.00 is required for
f a graduate degree. All graduate courses and courses taken for
aduate credit after matriculation as a degree candidate (except those
or taken for the grade of *CR*) will be used in the calculation of the
point index.
dent whose quality-point index falls below 3.00 will be placed on
n. This probation extends through the period in which the student next
12 semester hours of work, including prescribed courses. During this

period the student's performance will be monitored to determine suitability for continued study. A student who is subject to probation for a second time is automatically suspended.

A master's degree candidate who receives a grade of *F* is required to present cause, for consideration by the dean, as to why continued study should be permitted.

A master's degree candidate given the grade of *F* in a required course, and permitted to continue in graduate studies, must repeat the course and achieve at least the grade of *B*. (Such a repeat does not expunge the grade of *F*, which remains part of the student's record.) Should this level of performance not be obtained, the student will be denied further registration as a degree candidate

**Suspension**

A graduate student who does not meet the conditions of probation (see above) will be suspended. A student who is suspended or withdraws under these conditions may apply for readmission after the lapse of one semester. To be readmitted the student must submit evidence that indicates academic success if readmitted. A student so readmitted will continue on academic probation and must achieve a minimum quality-point index of 3.50 in the next 12 semester hours of graduate study. Should the student fail to achieve this minimum quality-point index, a second suspension will result and subsequent readmission will be denied.

**Incomplete/Authorized Withdrawal**

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described under Regulations.

The grade of *I* must be changed by a date agreed on by the instructor and the student but no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An Incomplete that is not changed within this period automatically becomes an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be changed by reregistering for the course here or by taking its equivalent elsewhere.

**The Thesis**

Students contemplating doctoral study are strongly urged to include the thesis as an elective in their master's program. The thesis subject should be selected as early as possible to permit effective integration with the course work.

The subject must be approved by the professor in charge of the student's field. The thesis in its final form must have the approval of the professor in charge and must be presented to the dean by the student no later than the date announced in the calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the Dean.

Payment of tuition for the thesis entitles the candidate, during the two semesters in which registered for thesis (299–300), to the advice and direction of the member of the faculty under whom the thesis is to be written. In case the thesis is unfinished, additional time is granted. The student must, however, be enrolled continuously in the program. If the preparation of the thesis extends more than three semesters beyond the date registered for thesis research, the student must register for the entire required hours of thesis again and pay tuition for the two repeated courses.

## MASTER OF ACCOUNTANCY

The Master of Accountancy degree is designed to prepare students for professional careers in accounting either in the public or private sector. A particular objective of the program is the student's attainment of professional certification. The Master of Accountancy is recognized as the necessary fifth year of education in a professional accounting program, and as such, it is superimposed on a Common Body of Knowledge in accounting and business subjects. The Common Body of Knowledge is ordinarily attained by the completion of a bachelor's degree in accounting or business from a regionally accredited institution of higher education.

The program consists of 60 semester hours of course work, of which 27 may be waived if comparable study has been completed prior to admission. Six semester hours of course work of the minimum program of 33 hours may be awarded as advanced standing.

Students should verify state regulations concerning the Certified Public Accountant Examination for the state in which they plan to practice.

The program of study consists of two levels.

### First Level: *Common Body of Knowledge Courses (30 semester hours)*

Accy 201, 202, 211, 297; BAd 220, 240; Econ 217; Mgt 205, 218, 270

This set of courses must be completed prior to enrollment in Second-Level courses, except Accy 297, which must be taken in the last semester of the program. All of these course requirements, except Accy 297, may be satisfied by evidence of successful completion of comparable work at other regionally accredited institutions. First-Level courses may not be taken to satisfy Second-Level requirements or electives.

### Second Level

Accy 221, 225, 251, 261, 275, 282; one course chosen from Accy 262, 263, or 264; and three graduate-level SGBA courses chosen from accountancy (other than taxation) and related subjects, with advisor approval.

## MASTER OF ASSOCIATION MANAGEMENT

The Master of Association Management prepares students to undertake or advance in careers in association management. It is also for practitioners who already work with nonprofit associations of various kinds—trade, public interest, membership, and special interest associations; scientific, technical, and learned societies; trade unions; political action committees; religious and fraternal organizations; foundations; and local ad hoc groups.

The 42-semester-hour program is interdisciplinary, with four academic departments participating in it—Public Administration, Business Administration, Management Science, and Accountancy. The program consists of a ten-course core, three other required courses, and an elective course.

### Required Courses

Core Courses *(30 semester hours)*

AM 270 The Association: Roles, Responsibilities, Authority, Accountability, Influence
AM 271 Marketing Management for Associations and Other Organizations
AM 272 Communications and Media Relationships for Associations
AM 273 Association Representation and Lobbying **or**
AM 274 Marketing Strategy for Associations
AM 275 Survey of Information Systems and Data Processing for Associations
AM 276 Organization and Management of Associations
AM 277 Finance and Fund Accounting for Associations

AM 279 Current Issues in Association Management
PAd 295 Research Methods
PAd 296 Statistical Applications in Public Administration

*Any two of the following courses (6 semester hours)*

PAd 212 Legislative Management
PAd 213 Administration in the Federal Government
PAd 215 Law and the Public Administrator
PAd 216 Federal Government Regulation of Society
PAd 242 Administration of State and Local Government
PAd 245 Intergovernmental Relations

*In addition, any one of the following courses (3 semester hours)*

PAd 223 Behavioral Factors in Large and Complex Organizations
PAd 224 Managerial Leadership in Complex Organizations
Mgt 210 Individual and Group Dynamics in Organizations
Mgt 212 Behavioral Factors in the Process of Change
Mgt 213 Organizational Development: A Management Function
BAd 210 Personnel Management

*Elective (3 semester hours)*

With the approval of the advisor, the student may satisfy this requirement by choosing any graduate-level course either from the above offerings or from other courses within the University.

**Substantive Areas**

Courses comprising this degree cover the six substantive areas described below.

MARKETING STRATEGIES AND REPRESENTATION

This area emphasizes the relationship between association members and managers and the means of conveying the association point of view to legislators, administrators, and the public at large. The association is viewed as the central focal point through which various constituent interests are articulated. Principal courses are AM 271 and either AM 273 or 274.

COMPARATIVE INSTITUTIONS

Washington-based associations provide a link between association membership and government. This area focuses on comparisons among the various types of associations that comprise the Washington environment and their relationships, interactions, and competition. The courses in this area are AM 270 and two courses chosen from PAd 212, 213, 215, 216, 242, and 245.

COMMUNICATIONS, MEDIA, AND INFORMATION SYSTEMS

Communication is a vital factor in modern management and is particularly important in the management of associations. The focus in this area is on elements of interpersonal communication with board, staff, and other association members and on the preparation, editing, and publication of journals and other written materials. Emphasis is placed on an appreciation of the value of continuing relationships with the media. The principal courses in this area are AM 272 and 275.

FINANCE AND ACCOUNTING

The curriculum includes consideration of the problems of financial planning, budgeting, accounting, and economics that are essential to all association management. The principal course, required of all students, is AM 277.

### ANALYTICAL AND RESEARCH METHODS

Courses comprising this area emphasize competence in research design and methods and in the application of statistical analysis. In the absence of a required thesis for the Master of Association Management, all students are required to take PAd 295 and 296.

### ASSOCIATION MANAGEMENT

This area focuses on the problems of managing association staffs. It concerns itself with the day-to-day problems of large and growing staffs and regional offices. The principal courses include AM 276 and 279, plus a course selected from PAd 223, 224; Mgt 210, 212, 213; or BAd 210. AM 279, the capstone seminar, must be taken during the student's final semester of study; it addresses the overall problems of association management, tying together what has been previously studied, with particular reference to growing legal restrictions that are placed on association managers.

## MASTER OF BUSINESS ADMINISTRATION

The Master of Business Administration degree is designed to prepare students for careers in management. The program of study leading to the Master of Business Administration provides a basic foundation in the functions of business, the environment in which it operates, and the analytical tools needed for intelligent decision making. The program provides a study in depth in one field of instruction and a broad exposure to subjects and issues at the general management level.

The program consists of 60 semester hours of course work, of which 27 may be waived if comparable study has been completed at a regionally accredited college or university prior to admission. Thus the shortest possible program is 33 semester hours.

The program of study consists of two levels and contains four components.

*First Level: Common Body of Knowledge Courses (30 semester hours)*

**Econ 217–18; Accy 201; Mgt 205, 218, 270; BAd 201, 220, 240, 297**

This set of courses must be completed prior to enrollment in Second-Level courses, except BAd 297 which must be taken in the last semester of the program. All of these course requirements, except BAd 297, may be satisfied by evidence of successful completion of comparable work at other regionally accredited institutions. Common Body of Knowledge courses not completed before the applicant matriculates in the School of Government and Business Administration will be assigned in the letter of admission. First-Level courses may not be taken to satisfy Second-Level requirements (breadth, field of instruction, or elective courses).

*Second Level*

1. *Breadth Courses (15 hours)*

Breadth courses provide exposure to a broad range of subjects intended to develop professional competence in general management. In consultation with a faculty advisor, students select five courses from at least four teaching fields outside the field of instruction. Students may design a program in consultation with their advisor that is tailored to individual career goals.

2. *Field of Instruction Courses (12 hours)*

This set of courses gives students depth of understanding in a selected field. Courses are selected in consultation with the faculty advisor and may be tailored to individual interests.

3. *Elective (3 hours)*

Students may select any graduate-level course to satisfy this requirement after consultation and approval of the faculty advisor.

4. *Required Common Body of Knowledge Course (3 hours)*
This course, BAd 297, Strategy Formulation and Implementation, is a required capstone course for all M.B.A. students. It must be taken in the last semester.

**Fields of Instruction**

Students select a minimum of 12 semester hours from one of the following fields.

BUSINESS ECONOMICS AND PUBLIC POLICY

This field is directed toward understanding, analyzing, and dealing with the principal forces shaping the total business environment. Special attention is given to the policies and programs of governments, social and cultural change, and the structure, evolution, and fluctuations of the economy. Students concentrating in this area take courses that survey the social, legal, political, and economic environment of business and the micro- and macroeconomic foundations of government programs and of business response to these programs. Elective courses may be chosen in business representation, public decision making, government regulation of business, government-business liaison functions, and public administration.

DECISION SYSTEMS

At all organizational levels, decision making is among the most important and most difficult responsibility of managers. This field prepares students to work with systems to improve and assist the decision process. The field is applications oriented and utilizes mathematical, statistical, and computer models. The student may choose either of two tracks: quantitative analysis for decision making, which focuses on the operations research content of decision systems or decision support systems, which emphasizes computerized systems that support the decision process.

FINANCE AND INVESTMENTS

This field prepares students for careers in finance and investments, providing a background in business budgeting, controllership, treasury, long-range planning, reporting, and financial management processes. Courses are designed to emphasize the planning, analysis, implementation, and controls necessary for making effective financial decisions. Instruction not only applies to manufacturing and trading enterprise but, in addition, includes railroad and public utility financing. Each, however, has distinctive operating features. Most financial dogmas have a universality that cuts across business lines, and variations are more a matter of degree than of substantive difference.

GENERAL MANAGEMENT SYSTEMS

This field addresses the critical need for management to deal effectively with the fact that human institutions of all kinds tend to become larger and more complex as changes accelerate both socially and technologically. In many traditional academic fields, general systems and cybernetic concepts have evolved as the interdisciplinary mode for understanding increasingly complex systems. This has profound relevance for the contemporary operating manager and policymaker.

Because this program is essentially interdisciplinary and transcontextual in nature, the student is afforded an unusually broad range of opportunities to apply educational experience to managerial, organizational, and societal problems. Professional and academic career potentials are available in the following

fields: (1) research and teaching in the growing number of systems and cybernetics oriented programs now emerging in colleges and universities in the United States and elsewhere in the world; (2) institutional/environmental interface management or consulting; (3) system-focused organizational development consulting or staff work; (4) corporate and government agency long-range (strategic) planning and control activities; and (5) advisory and staff positions and program directors in global agencies such as operating components of the United Nations, multinational corporations and foundations, and multigovernmental agencies such as OECD, as well as in the agencies and departments of national governments.

INFORMATION SYSTEMS MANAGEMENT

This field is concerned with issues related to modern information and decision support systems in private and governmental organizations. Areas include systems analysis, user–system psychology, and trends in information systems.

The program is designed for the professionals responsible for analyzing the information system needs of an organization and developing an implementation plan for meeting requirements. Plans would deal with the determination of the information needs and information flows within the organization. The information system professional selects the proper blend from the options available: information systems, database management systems, decision support systems, and expert systems. These decisions are based on knowledge of available technology and an understanding of the psychological aspects of user acceptance and productivity.

INTERNATIONAL BUSINESS

This field is designed to prepare students for careers in international banking, international and multinational corporations, and export trading companies; for careers in the federal government and in international agencies concerned with business, industry, and finance abroad; and for the commerce option of the Foreign Commercial Service.

The program is also designed to provide international students with the background and skills necessary to promote international business, and to prepare them for careers in foreign and domestic firms within their own countries and for commercial officer positions within their governments.

Each student's program is individually developed by the student's advisor according to the student's background and interests.

LOGISTICS, OPERATIONS, AND MATERIALS MANAGEMENT

This field addresses issues related to management and operating skills in the several work areas it encompasses at the national and international level as well as in the private and public sectors. Activities in this field include materials acquisition, production, quality control, distribution, maintenance, and support functions throughout the life of the organization, system, or product. Personnel skilled in these activities stimulate organizations to increase productivity and organizational effectiveness.

The program focuses on the integration of the administrative functions associated with transactions, technology, production, and services necessary to institutional success. The field is designed to provide students with knowledge of acquisition and logistics functions and to develop the capacity to analyze information, define problems, evaluate quality, assess impacts, and draw conclusions pertinent to logistics plans and operations. Students are encouraged to emphasize formulation of objectives, planning, and management of

operations throughout the system life cycle. Each student elects a study track (procurement and contracting, physical distribution, or product operations) in consultation with a designated advisor.

### MANAGEMENT OF SCIENCE, TECHNOLOGY, AND INNOVATION

This field explores the many aspects of technology relating to and influencing research and development management, business, and public policy. The employment of state-of-the-art technology and the creation of new technology through research and development are important processes in the achievement of the objectives of both private firms and governments.

The research and development environment has many unique operational characteristics. The concentration has been designed to identify and study the problems associated with managing creative professional people in a dynamic technology. As a contextual area, the program stresses the need for students to undertake original and meaningful research involving political, economic, sociological, and operational problems encountered by management in industrial, governmental, and military research and development organizations.

### MARKETING

This field is devoted to the development of professional marketing managers whose responsibilities may include planning and developing new products, services, and ideas; advertising, selling, and merchandising; and arranging distribution channel systems. Courses cover all aspects of the marketing management function. Foundation courses are Marketing Management, Buyer Behavior, and Marketing Research. Functional courses are Promotion Management, Marketing Channels, Marketing Strategy, and Product/Service Management. Specialized elective courses—International Marketing, Industrial and Government Marketing, and Marketing and Public Policy—utilize the resources of the Washington metropolitan area.

### ORGANIZATIONAL BEHAVIOR AND DEVELOPMENT

This field of study reflects the assumptions that the effective utilization of the behavioral sciences is concerned with both means and ends and that the specialist in behavioral science not only is skilled in theory and research but also applies technical and specialized knowledge as a conscious force in effective organizational growth and improvement. Thus, courses are designed to equip the student with organizational concepts and behavioral skills appropriate to optimizing the utilization of a human system's total resources.

This program helps meet the need for professionals capable of designing, creating, and developing the necessary behavioral and organizational systems appropriate to rapidly changing societies. Emphasis is on the interrelationships of such dimensions as motivation, leadership, problem solving, organizational growth, and increased complexity of modern organizations and their effect upon the functions of organizational development.

### PERSONNEL MANAGEMENT

This field is concerned with all aspects of the employment of human resources in business organizations. Career opportunities are open in domestic and international business organizations, hospitals, trade associations, research and educational institutions, and local, state, and federal government agencies. Courses encompass all phases of the recruitment, selection, employment, and development of people, industrial relations, unionism, collective bargaining, labor relations, and manpower utilization.

### URBAN DEVELOPMENT

This field is designed to provide interdisciplinary and applied studies for students preparing for a business career in urban development processes. The field combines the fundamental economic principles and concepts that govern the urban investment and development process with those that emphasize the analysis of specific projects, including site requirements and physical relationships, holding capacity, market conditions, financial feasibility and requirements, legal framework and constraints, and opportunities associated with the public sector and long-term community needs.

The field prepares students for careers in mortgage banking, housing, construction and building management, real estate sales and appraisal, development planning and public policy, commercial leasing and marketing, financing, and construction lending.

## MASTER OF HEALTH SERVICES ADMINISTRATION

The Master of Health Services Administration degree program is designed to provide a core of generalist administrator courses for all students, coupled with specialized elective fields of instruction to meet the interests and career objectives of individual students.

The program of study consists of 54 semester hours of course work. In addition, 3 semester hours each in accountancy, economics, and statistics are prerequisite if comparable study has not been completed prior to matriculation as a degree candidate.

The generalist core includes the following nine courses: HSA 202, 203, 207, 208, 209, 210, 212, 215, and Mgt 210. In addition, each student must take two advanced HSA courses, one chosen from Group I and one from Group II, from among the following:

Group I (Policy/Planning)—HSA 221, 223, 225, 227, 252, 255.

Group II (Management)—HSA 231, 233, 235, 236, 237, 238, 239.

During the last semester on campus, each student must also complete HSA 245, which serves to integrate the concepts and methods of health services administration.

The fields of instruction each comprise 18 credit hours, including an experience-based learning component. In some fields of instruction, a one-year (9-semester-hour) administrative residency is mandatory. In other fields of instruction, the student may choose a 3-semester-hour internship and 6 semester hours of additional course work as a substitute for the 9-hour residency. Consequently, fields of instruction fall into one of two patterns:

Residency Option—Specialist course work, 9 hours; administrative residency, 9 hours. Students will not be permitted to enter any administrative residency unless they have attained a 3.0 quality-point average with no grades of *I*.

Internship Option—Specialist course work, 15 hours; administrative internship, 3 hours.

Courses comprising the field of instruction may be taken in the Health Services Administration Department, the School of Government and Business Administration, the University, or the Consortium of Universities. Each student develops a set of conceptually related courses suitable for the field of instruction and individual career objectives. The choice of courses must be approved by the faculty advisor and the department(s) offering courses.

This curriculum structure gives students an unusual opportunity to develop academic programs particularly suited to their needs. The core courses and the two advanced HSA courses provide students with generalist administrative competence; the nine fields of instruction offer a wide choice of areas in which to develop special expertise. In all but three fields of instruction, students have a choice concerning the amount of experiential learning they wish to include in their programs of study. This choice concerning the amount of field experience can affect the number of months required to complete the program; that is, for a full-time student the residency option will require 28 months, while the internship option will require 20 months.

### Fields of Instruction

An asterisk indicates that a 9-credit-hour administrative residency is required in that field of instruction.

#### MANAGEMENT OF ACUTE CARE HOSPITALS*

This field of instruction is designed to provide an understanding of the organization, management, and interrelationships of hospital clinical, support, and administrative functions, and analysis of systems and procedures used to provide short-term inpatient services. Students are also provided with a managerial base in the areas of health services policy-making, regulation, and legislation.

#### MANAGEMENT OF LONG-TERM CARE SERVICES*

This field explores a wide range of medical and support services required on a recurring or continuous basis by individuals who are unable to function independently because of chronic mental or physical impairment. These services are provided in a variety of settings, including homes for the aged, chronic care, rehabilitation or psychiatric hospitals, hospitals or homes for the mentally retarded and developmentally disabled, geriatric centers, and the client's home. The field also provides a management base in the areas of health services planning, policy-making, regulation, and legislation as applied to long-term care.

#### MANAGEMENT OF AMBULATORY HEALTH SERVICES*

This field addresses the critical need for managing the delivery of health and medical services to individuals who do not require the constant supervision associated with inpatient care and can either travel to the site where service is provided or be treated in their domicile. Although this definition includes such activities as individual practice of medicine, instruction will focus only on the management of services in organizational settings in which two or more individuals are engaged in delivering ambulatory care as a service offered by a formal organization. Examples of settings for ambulatory services are hospital outpatient departments, medical group practices, health maintenance organizations (HMOs), and public health center clinics. Ambulatory services administrators also work in the areas of health services planning, policy-making, regulation, and legislation.

#### HEALTH INFORMATION SYSTEMS

This field is designed to provide an understanding of information systems as they are used in the administration of health services. The application of electronic data processing or computers to health care is stressed. Although some knowledge of programming languages will be necessary, the concepts of

information and computer systems will be emphasized. Examples of the areas of application are medical records, program evaluation, community/national health statistics, financial management assessment, and productivity control.

HEALTH SERVICES FINANCIAL MANAGEMENT

This field responds to a demand for a thorough understanding by the administrator of financial management in health institutions. The instruction includes managerial accounting, cost analysis, financial decision making, capital formation, and investment analysis, with specific adaptation to unique problems within the health care field.

HEALTH SERVICES MATERIALS MANAGEMENT

This field explores the management of physical resources in health service institutions. The instruction focuses on the purchase and management of supplies and equipment, inventory management, contracting, cost allocation, plant operations, and facilities maintenance.

HEALTH SERVICES POLICY, MARKETING, AND PLANNING

This field is designed for those who wish to focus on strategic planning and marketing of health care systems and health care institutions and on health policy development and analysis. An emphasis on policy skills will enable the student to develop realistic and accurate statements of principles that can guide the health activities of governments, institutions, and other organizations. An emphasis on planning and marketing skills will enable the student to develop strategies based on values expressed by health services policies and to conduct marketing activities within health services organizations. Skills related to achieving acceptance of policies and implementation of plans will also be developed. The overriding concept is that of strategic health decision making in an atmosphere of systematic inquiry with an awareness of values.

HEALTH SERVICES AND OPERATIONS RESEARCH

This field deals with the application of research techniques and methodologies to the delineation of policy issues and the generation of solutions to problems in the organization, delivery, and financing of health services. Operations research is the application of mathematical techniques such as linear and nonlinear programming, queuing models, and simulation to develop solutions for operating and policy problems.

HUMAN RESOURCES MANAGEMENT

This field covers resources planning, allocation, utilization, and development and evaluation of health services personnel. Included are the various personnel functions, the development of personnel policies and procedures, employee and labor relations, and collective bargaining.

## MASTER OF PUBLIC ADMINISTRATION

The Master of Public Administration degree program prepares students for professional careers not only in the public service (federal, state, and local) but also in organizations that require a knowledge of public policy and administration, such as public interest groups and research institutes. The 42-semester-hour program, outlined below, is intended to provide both a generic core for all students and specialized elective fields tailored to the interests and career objectives of each individual student. The curriculum provides graduate instruction in all areas recommended by the Guidelines and Standards for

Professional Master's Degree Programs issued by the National Association of Schools of Public Affairs and Administration.

All students are required to complete an eight-course (24-semester-hour) core, which includes courses in public administration and management, public expenditure analysis, public policy, organization theory, human behavior in organizations, and research methods; at the end of the program, students are required to take PAd 289, which serves to integrate the diverse perspectives in public administration.

Each student selects, in addition, an elective field designed to provide a deeper and broader knowledge in a field of particular interest. The elective fields generally require a four-course sequence. The program is sufficiently flexible that, with the approval of a faculty advisor, the student may design a special field when none of the fields offered matches individual learning and career objectives.

Students who lack substantial knowledge of the structure and functioning of government are strongly encouraged to take one of two courses in American administrative institutions: PAd 213, Administration in the Federal Government, or PAd 242, Administration of State and Local Governments. The remainder of the program consists of two elective courses chosen by the student with the advisor's approval. The electives may be taken in any related program or discipline.

Because public service requires a wide variety of expertise, students with all undergraduate degree backgrounds are considered for admission. There are no specific course prerequisites.

### Required Courses

PUBLIC ADMINISTRATION REQUIRED CORE (24 semester hours)

PAd 205 Introduction to Public Administration and Management
PAd 295 Research Methods
PAd 296 Statistical Applications in Public Administration
PAd 261 Policy Analysis in Public Administration **or**
PAd 260 Policy Formulation and Administration
Mgt 210 Individual and Group Dynamics in Organizations **or**
PAd 221 Organization Theory and the Public Sector
PAd 252 Public Expenditure Analysis and Planning
PAd 289 Public Program Management and Policy Implementation
PAd 213 Administration in the Federal Government **or**
PAd 245 Intergovernmental Relations

ELECTIVE FIELDS (12 semester hours—see below)

AMERICAN ADMINISTRATIVE INSTITUTIONS (3 semester hours)

Either PAd 213, Administration in the Federal Government, or PAd 242, Administration of State and Local Governments, is recommended as an introductory course. In some of the elective fields, either course may be counted as 3 of the 12 required semester hours.

ELECTIVE COURSES (6 semester hours)

### Elective Fields

The nine elective fields offered within the Department of Public Administration are described below. Twelve semester hours are required for each field. In addition to the fields listed below, students may elect such other standard four-course fields as Business Economics and Public Policy, Organizational Behavior and Development, Information Systems Management, International Business, and Quantitative Analysis for Decision Making. Students may also take an

approved four-course sequence in the Department of Health Services Administration or the Department of Urban and Regional Planning. Moreover, a special field may be constructed, tailored to the student's academic interests and career objectives. To take a special field, the student writes a brief justification, specifying the courses to be taken, and submits it by petition through the faculty advisor.

BUDGET AND PUBLIC FINANCE

This field covers the processes and institutions involved in budgeting, including the practical requirements of financial management; addresses issues of intergovernmental finance in a federal system; and imparts knowledge of alternative methods for allocating scarce public resources. The field is most directly suited to those who are or envision becoming budget analysts or financial management officers in public agencies.

EXECUTIVE, LEGISLATIVE, AND REGULATORY MANAGEMENT

This field offers students the opportunity to develop an expertise in the management of federal government. It includes course work in the workings of the executive and legislative branches, with specific emphasis on the regulatory process, the civil service, administrative law, and congressional oversight. Geared to midcareer managers as well as entry-level graduate students, this field gives special attention to the practical functions of public management: implementation, accountability, and effectiveness.

MANAGEMENT OF NATIONAL RESOURCES

This field is designed to provide advanced course work exclusively to senior military and civilian officers at the Industrial College of the Armed Forces. The field prepares these officers for assignments that will require them to work closely with the private and public sectors in national resources management in time of war, and it prepares them for professional careers in the public sector.

MANAGING IN PUBLIC ORGANIZATIONS

This field gives primary attention to the managerial processes by which organizations are structured and their work undertaken. It includes courses in organizational theory and large organizations but is also concerned with the management of governmental activities. It is for students who intend to pursue careers in management.

MANAGING STATE AND LOCAL GOVERNMENTS

This field is designed for students interested in pursuing careers in state and local government administration. Students learn to deal with a range of federal, state, and local problems and issues, including alternative governmental structures and assignments of functions, sources of revenues and expenditure patterns, intergovernmental relations and management concerns, local government financing, and the formulation and analysis of urban policies.

POLICY ANALYSIS AND EVALUATION

The policy field is designed for those who wish to focus on the processes of public decision making and develop abilities to analyze and evaluate those processes. This field is most directly appropriate for those who now hold or anticipate taking staff analyst positions in government agencies or similar positions in research or consulting firms.

PROCUREMENT AND CONTRACTING

This field covers the many activities of government performed under contractual arrangements. Increasingly, public agencies find the most efficient, and often the only, method of meeting needs is through procurement action. This dimension of public administration is often subject to unique practices and regulations and requires the acquisition of specialized knowledge and skills in the processes of procurement and contracting. This elective field, offered jointly with the Department of Business Administration, promotes a better understanding of public–private interactions in procurement activities.

PUBLIC PERSONNEL ADMINISTRATION AND MANPOWER

This field addresses the traditional concerns in public administration with personnel, the staffing function of public organizations, and labor relations in the public sector. Courses are also offered in manpower development and the use of human resources. Graduates concentrating in this field typically work in personnel administration at some level of government.

TELECOMMUNICATIONS MANAGEMENT

This field is designed for public managers who will find it valuable to understand the various capabilities of telecommunications to organize and utilize information within an organization, to appreciate the policy issues involved in the regulation of telecommunications, and to be conversant with the terminology and structures of telecommunication systems.

**Internships**

Students with little or no professional experience are strongly encouraged to take an internship during the degree program. There are many opportunities in the Washington area for intern experiences in federal agencies, county and city government agencies, and the quasi-public sector. The Department assists students in securing appropriate internships; students are also encouraged to find internships on their own initiative. A substantial effort is made to relate the intern experience to the student's academic program. Internships may be paid or unpaid and may be taken for credit or not for credit. To receive academic credit, students must have completed 9 credit hours in the degree program. In general, internships for credit involve 15–20 hours of work per week for 14 weeks. Also, see Government Intern Scholarship Program under Special Programs, below.

## MASTER OF SCIENCE IN INFORMATION SYSTEMS TECHNOLOGY

The Master of Science in Information Systems Technology provides preparation for a career in the application of computers to the data and information problems found in organizations today. The program emphasizes a practical understanding of contemporary design and implementation approaches utilized in the development of computer-based systems.

The program consists of 51 semester hours of course work and a comprehensive examination. Course work includes 21 hours of undergraduate prerequisites and 30 hours of graduate courses, including 6 hours of electives. Prerequisites may be waived if comparable work has been taken at GWU or at a regionally accredited college or university, provided a grade of C or better was earned in prerequisite courses. A cumulative quality-point index of 2.5 must be maintained in all prerequisite courses.

**Degree Requirements**

1. Twenty-one semester hours of prerequisite courses or equivalent as follows:
   a. An introductory computer course involving programming (e.g., FORTRAN, BASIC, or PASCAL).
   b. Two additional advanced programming courses covering at least one additional programming language (e.g., PL/1, COBOL, or C). COBOL is strongly suggested as one of the languages.
   c. Two additional advanced undergraduate courses in areas such as assembly language programming, computer systems architecture, data structures, systems analysis, operating systems, data communications, or database systems.
   d. Two semesters of undergraduate mathematics comparable to Math 31 and 32, or 51 and 52.
2. Completion of 30 semester hours of graduate course work with a quality-point index of 3.0, including the following courses plus 6 semester hours of electives:
   Mgt 220 Quantitative Factors in Administration
   Mgt 280 Information Systems Development and Application
   Mgt 282 Information Systems and Telecommunications
   Mgt 283 Topics in Higher-Level Languages
   Mgt 284 Database Systems
   Mgt 286 Operating Systems
   Mgt 287 Design of On-Line Information Systems
   Mgt 288 Applied Artificial Intelligence Programming **or**
   Mgt 290 Special Topics in Management Science
3. Successful completion of a written Master's Comprehensive Examination.

## MASTER OF TAXATION

The Master of Taxation degree is designed to prepare students for careers as tax professionals in public accounting, private industry, and government. The program of study provides a thorough understanding of the tax laws and their application. It also supplies the necessary foundation for a broad appreciation of the business environment.

The program consists of 60 semester hours of course work, of which 27 hours may be waived if comparable study has been completed prior to admission. Six semester hours of the minimum program of 33 hours of course work may be awarded as advanced standing.

The program of study consists of two levels.

*First Level: Common Body of Knowledge Courses (30 semester hours)*

Accy 201, 202, 211, 297; BAd 220, 240; Econ 217; Mgt 205, 218, 270.

These courses must be completed prior to enrollment in Second-Level courses, except Accy 297, which must be taken in the last semester of the program. All of these course requirements, except Accy 297, may be satisfied by evidence of successful completion of comparable work at other regionally accredited institutions. First-Level courses may not be taken to satisfy Second-Level requirements or electives.

*Second Level*

1. *Required Courses (21 hours)*

Accy 225, 260, 261, 262, 263, 264, 265

2. *Electives (9 hours)*

Elective courses are to be selected in consultation with the designated faculty advisor.

3. *Required Common Body of Knowledge Course (3 hours)*

This course, Accy 297, is a required capstone course. It must be taken in the last semester.

## MASTER OF URBAN AND REGIONAL PLANNING

The Master of Urban and Regional Planning is a professional degree program designed as preparation for a broad range of professional careers in both the

private and public sectors. The 50-semester-hour course of study provides a broad education to develop competence in planning theory and methodology and to emphasize the analytical ability and creativity necessary for solving urban and regional problems. Emphasis is placed on the formulation of realistic planning solutions and the practice of urban and regional planning.

The degree is awarded by vote of the faculty after satisfactory completion of the following requirements.

1. Three semester hours each in prerequisite micro- and macroeconomics completed at a regionally accredited college or university prior to admission or within the first half of the program.
2. The core courses, consisting of 32 semester hours:
   U&RP 201 Planning Theory and Practice I
   U&RP 202 Planning Theory and Practice II
   U&RP 203 Principles of Community Planning and Design
   U&RP 207 Land Development Planning
   U&RP 208 Land Use and Urban Transportation Planning
   U&RP 210 Urban Development Economics
   U&RP 211 Methods of Urban and Regional Analysis I
   U&RP 212 Methods of Urban and Regional Analysis II
   U&RP 215 Advanced Planning Problems
   U&RP 218 Metropolitan and Regional Planning
3. A field of concentration, with a minimum of 9 semester hours.
4. Six semester hours of elective courses.
5. A minimum of three months full-time (or equivalent) supervised professional work experience in planning, with an acceptable written report approved by faculty advisor.
6. A written Master's Comprehensive Examination following completion of all course work.
7. A thesis (3 semester hours) based on the candidate's research; the thesis usually complements the chosen field of concentration.

While the typical program of study, including the thesis, comprises 50 semester hours, requirements may be reduced to a minimum of 45 semester hours, depending upon the student's background and professional experience.

**Fields of Concentration**

Each student is required to develop a field in an area of professional specialization. A field must consist of a minimum of 9 semester hours, including a required two-course sequence. The two courses include the field's theories, concepts, and methods and their synthesis and application by means of case studies and projects. Instruction is available in the following fields.

HOUSING AND COMMUNITY DEVELOPMENT

The fundamental elements of community development are explored in this field, including housing, community facilities, fiscal policy, urban economics, and neighborhood dynamics. Emphasis within the courses of instruction is on problem identification and analysis and on plan and program formulation. Specialization in this field provides excellent preparation for professional planning positions in the public and private sectors.

COMMUNITY PLANNING AND DESIGN

The field of community planning and design is concerned with improving the relationship between people and the environment. From an understanding of users' needs and perceptions, students develop and apply their aesthetic sensibilities and creative skills in problem solving. The process, theory, principles, and techniques of community design form the basis for preparing

and testing plans that are physical manifestations of a community's goals and aspirations. The field prepares students for applying this "social art" in a wide range of public and private planning positions.

HISTORIC PRESERVATION

This program is designed to foster an understanding of the historic attributes of architecture and landscape, from the extraordinary monument to the most ubiquitous of patterns; developing skills to document, assess, and protect our historic legacy; and acquiring a sensitivity to design and planning issues central to managing the forces of growth and change within a historic context. Preservation is also examined as process, involving a wide range of participants, that can vary in complexion, focus, and concrete goals. The ability to solve problems in preservation is emphasized over any set of administrative or political procedures.

NATIONAL AND INTERNATIONAL DEVELOPMENT PLANNING

This field is designed to provide a base of knowledge and experience for students interested in urbanization, development, and planning in other countries. Comparative study, case analysis, and directed research (overseas in appropriate circumstances) are combined to enable students to become prepared for a variety of professional roles in the international development field.

## SPECIALIST IN HEALTH SERVICES ADMINISTRATION

Students with a master's degree in an approved related field or with a master's degree and managerial experience may undertake studies leading to the degree of Specialist in Health Services Administration. This program serves people who plan to begin a career in management, policy-making, or planning in the field of health services or who wish to supplement previous graduate study in health services administration.

Most students with adequate preparation in health services administration or a related management field should be able to complete the requirements by undertaking a 30-semester-hour program of study. Those lacking specialized preparation will need additional course work, depending on career goals. Field experience assignments, if required, are in addition to the 30-semester-hour minimum.

Individual programs will be developed in consultation with a faculty advisor on the basis of the student's educational background, experience, and specific professional objectives.

All students must take at least one doctoral-level seminar in health services administration (HSA 310 or 330) and complete a 3-semester-hour research project (HSA 270). The remaining hours may be taken in health services administration or other appropriate disciplines.

## DOCTORAL PROGRAM

The degree of Doctor of Philosophy is offered in accountancy, business administration, health services administration, information and decision systems, management and organization, and public administration. The Committee on Doctoral Studies supervises all aspects of the program.

### Admission

The minimum admission requirement is a bachelor's degree from a regionally accredited college or university, preferably with a major appropriate to the

proposed field of study. Most applicants have completed a master's degree in an appropriate field. Applicants whose degrees are in fields other than their proposed field of study are expected to obtain the necessary background either before or soon after admission to the program. Scores on the Graduate Record Examination or the Graduate Management Admission Test are required. However, applicants who have taken the Law School Admission Test or the Medical College Admission Test may submit these test scores for consideration. Under special circumstances, scores on the Miller Analogies Test may also be submitted. Applicants whose test scores are more than 10 years old are required to take or retake the Graduate Record Examination or the Graduate Management Admission Test. Applicants whose test scores are more than five years old are encouraged but not required to take or retake either of the tests. Arrangements to take the tests must be made with the Educational Testing Service. Students whose native language is not English must also submit the Test of English as a Foreign Language (TOEFL) scores with a total score of not less than 550.

The Doctoral Committee does not use specific cutoff points for grade averages and test scores. It carefully reviews each applicant's entire record and makes its selection on a competitive basis in keeping with enrollment limitations.

Completed applications must be sent to the Office of Enrollment Development and Admissions, School of Government and Business Administration, George Washington University, Washington, D.C. 20052, by March 1 for the fall semester and summer sessions and by October 1 for the spring semester. Applicants are notified of their eligibility for admission four to five weeks subsequent to established dates for receipt of the completed application and all required supporting credentials.

### Plan of Study

The doctoral program consists of two major parts: the pre-dissertation stage and the dissertation stage. The objective of the pre-dissertation stage is to provide the student with the theoretical foundations and practices of the primary and supporting fields of study and with a command of the relevant qualitative or quantitative analytical methods. The objective of the dissertation stage is to have the student apply the obtained theoretical and practical knowledge and analytical methods to the resolution of a research problem. The research should be original and is expected to result in a contribution, either applied or theoretical, to the existing body of knowledge. The total program must be finished in seven years; only under very special circumstances can extensions beyond this time limit be given by the Committee on Doctoral Studies.

The pre-dissertation stage is based on an individual study plan developed by the student under the guidance of the primary and supporting field advisors during the first academic year. In the study plan the student must state long-range professional objectives, all proposed academic activities, methods of evaluation, and a semester-by-semester schedule.

All students, regardless of the primary field of study, must include in their study plan Mgt 390, Philosophical Foundations of Administrative Research, and the multidepartmental course, 311–12, Seminar: Public–Private Sector Institutions and Relationships. These courses should be taken during the first academic year after admission. Mgt 391, Methodological Foundations of Administrative Research, must be taken at the end of course work.

In addition to the evaluation methods proposed in the study plan, the primary and supporting field advisors evaluate the student's progress at the end of the first and second semesters after admission, and thereafter at the end

of the spring semester of each academic year. A comprehensive evaluation of study plan activities for both the primary and supporting fields is the final process of the pre-dissertation stage.

As background, a student whose field is designated as Business Administration must demonstrate, either through prior academic experience or through the proposed content of the doctoral study plan, a working knowledge of the principal content areas of business administration.

Supporting fields may be chosen from other departments of the University. A student selecting a field outside of the School, however, must meet the academic and administrative requirements of the department involved.

For more detailed information on the program and its administration, see the *Handbook on the Doctoral Program*, available in the Doctoral Program Office.

## SPECIAL PROGRAMS

### Government Intern Scholarship Program

The Government Intern Scholarship Program offers annually 50 scholarships to assist government agencies in educating carefully selected young men and women for administrative leadership in government career service. Interns who do not already hold a master's degree may be eligible for a scholarship that provides full tuition for two 3-hour courses in one semester, and interns who maintain satisfactory standing in their government employment and a 3.0 quality-point index in their academic program may qualify for a second scholarship in a later semester.

### Continuing Education in Health Services Administration

A nondegree program is conducted, both on and off campus, in the various areas of health services administration whenever a sufficiently large class is organized. Institutes, workshops, and lecture series are conducted under the auspices of program faculty and selected leaders from local, state, and regional areas on topics of current interest to the requesting organization. There is no specific prerequisite. Fees are to be announced.

The Department of Health Services Administration offers five noncredit courses in long-term care administration through its Home Study Program. These correspondence courses are approved for preparation for licensure as a nursing home administrator and/or required continuing education for licensure renewal in many states. Additionally, they provide comprehensive study for administrative personnel wishing to broaden their knowledge of this expanding field.

### International Institute for Health Services Administration

In recognition of special educational needs of students from other countries, the International Institute for Health Services Administration offers programs of instruction designed to meet these needs at either the degree or certificate level.

It is also equipped to enter into arrangements with principals of hospital systems in worldwide areas to assist in the preparation of teaching programs or the actual instruction of administrative personnel either abroad or at the University.

### Joint Master's and Juris Doctor Degree Program

In certain instances arrangements may be made for students to work concurrently toward both the Juris Doctor degree in the National Law Center and a

master's degree in some fields in the School of Government and Business Administration. Students must apply separately and be admitted to both the National Law Center and to the School of Government and Business Administration and must meet all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

**Certification of Purchasing Managers**

The School of Government and Business Administration participates in the three nationally recognized certification programs. The *Certified Public Purchasing Officer* (CPPO) is administered by the National Institute of Governmental Purchasing, 115 Hillwood Ave., Falls Church, Va. 22046; the *Certified Professional Contracts Manager* (CPCM) is administered by National Contract Management Association, 6728 Old McLean Village Dr., McLean, Va. 22101; the *Certified Purchasing Manager* (CPM) is administered by the National Association of Purchasing Management, 496 Kinderkamack Rd., P.O. Box 418, Oradell, N.J. 07649.

## SCHOOL OF INTERNATIONAL AFFAIRS

*Dean* M.A. East
*Associate Dean* H.R. Nau
*Assistant Dean* G. Ludlow

### FACULTY 1987–88

*Professors* W.H. Becker, J.J. Cordes, R.M. Dunn, Jr., M.A. East, J.A. Frey, R.S. Goldfarb, M. Gordon, O. Havrylyshyn, P.P. Hill, H.C. Hinton, M.A. Holman, C. Hsieh, J.W. Kendrick, Y. Kim, P.F Klarén, J.E. Kwoka, Jr., H.L. LeBlanc, W.H. Lewis, C.A. Linden, J.M. Logsdon, J.C. Lowe, J.A. Morgan, Jr., J.N. Mosél, C.A. Moser, H.R. Nau, B. Nimer, J. Pelzman, H. Pollack (*Research*), B. Reich, L.P. Ribuffo, J.W. Robb, H.M. Sachar, B.M. Sapin, C.W. Shih, G. Sigur, H. Solomon, G. Stambuk, C.T. Stewart, Jr., R. Thornton, S.J. Wayne, A.M. Yezer
*Adjunct Professors* T.F. Carroll, J.F. Coates, V.T. Coates, J. Hardt, R.L. Kugler, E.L. Warner
*Professorial Lecturer* K.S. Flamm
*Associate Professors* C.J. Allen, M.A. Atkin, E. Berkowitz, B.L. Boulier, J. Chaves, C.J. Deering, C.F. Elliott, H.B. Feigenbaum, J. Henig, C.J. Herber, W.R. Johnson, C.C. Joyner, D.L. Lee, G. Ludlow, C. McClintock, Y. Olkhovsky, R.W. Rycroft, M. Sodaro, H.S. Watson, S. Wolchik, R.Y. Yin
*Adjunct Associate Professor* M.B. Wallerstein
*Assistant Professors* M.D. Bradley, N.J. Brown, J.H. Lebovic, J.P. Rogers, S.C. Smith, G.C.Y. Wang

**Committees***

DEAN'S COUNCIL

M.A. Atkin, R.M. Dunn, P.P. Hill, H.L. LeBlanc, J.M. Logsdon, J. Pelzman, B. Reich

* The Dean of the School is an ex officio member of all committees.

COMMITTEE ON APPOINTMENTS, PROMOTIONS, AND TENURE

W.R. Johnson (*Chair*), M.F. Gordon, O. Havrylyshyn, H. Nau, B. Sapin

## INTRODUCTION

The School of International Affairs offers graduate and undergraduate programs to prepare individuals for an increasingly international and multinational environment. The historical roots of the School can be traced back to the establishment of the School of Comparative Jurisprudence and Diplomacy in 1898. In 1966, the School separated from the School of Government, Business, and International Affairs to become an independent unit, the School of Public and International Affairs. In 1987, the name was changed to the School of International Affairs to reflect the more central focus on international affairs.

### Academic Programs

The School has undergraduate and graduate programs in International Affairs, Latin American Studies, East Asian Studies, and Middle Eastern Studies and graduate programs in Russian and East European Studies, Security Policy Studies, and Science, Technology, and Public Policy. Programs are multidisciplinary and emphasize both domestic and foreign governmental policy. Course offerings draw heavily on the various academic departments of the University.

Undergraduate programs are designed to foster a liberal education that focuses on a solid understanding of major historical and contemporary issues in international affairs. The programs tend to have a broader base than a major in a traditional academic discipline.

Graduate programs lead to the degree of Master of Arts. Students develop a higher level of competence in a world region or a discipline in preparation for professional employment in government or in international organizations, agencies, or business.

## REGULATIONS

See Admissions; Registration; Fees and Financial Regulations; Regulations.

### Attendance

Students are held responsible for all of the work of the courses in which registered, and all absences must be excused by the instructor before provision is made to make up the work missed.

A student suspended for any cause may not attend classes during the period of suspension.

### Withdrawal

Withdrawal without academic penalty after the end of the fifth week of classes (fall or spring semester) is permitted only in exceptional cases (see Withdrawal, page 47).

## THE DEGREE OF BACHELOR OF ARTS

The School offers programs leading to the degree of Bachelor of Arts in the fields of international affairs, East Asian studies (China or Japan), Latin American studies, and Middle Eastern studies.

## ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the program of studies contemplated are required.

Requirements for admission to the freshman class are as follows:

1. An acceptable certificate of graduation from an accredited secondary school, showing at least 15 units,* which must include four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and one year of college-preparatory mathematics beyond introductory algebra.

2. The principal's statement that the applicant is prepared to undertake college work.

3. Standardized test scores submitted on College Board Achievement Tests in English composition and mathematics and on the Scholastic Aptitude Test, or on the American College Testing battery.

It is recommended that the College Board examinations be taken in December or January. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the College Board Admissions Testing Program, CN 6200, Princeton, N.J. 08541–6200, not less than one month before the date of the tests. In applying for the test, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

American College Testing battery scores are also accepted. The applicant should request that these scores be sent to the Office of Admissions directly from the American College Testing Program, Iowa City, Iowa. It is recommended that the applicant take the tests in October of the senior year.

Consideration can be given to the adequacy of the qualifications of an applicant who, because of unusual circumstances, does not present all of the formal requirements stated here. Appropriate scholastic-aptitude tests may be prescribed.

## GENERAL REQUIREMENTS FOR THE DEGREE

### Academic Work Load

The normal academic work load for a full-time student is 15 semester hours. A full-time student not on probation may take a course load of up to 17 semester hours. A student with a strong academic record may take up to 18 semester hours with the approval of the dean. Students on probation are advised to limit their course load to 12 hours; they may take up to 15 hours with the approval of the dean.

### Scholarship Requirements

In order to graduate, a student must have the following: (1) 120 semester hours (or 90 semester hours if the student qualifies for the special 90-semester-hour program) of passing grades (courses in exercise and sport activities cannot be included in the required hours); and (2) a cumulative quality-point index of at least 2.0.

#### DEAN'S HONOR LIST

The name of every student who attains a 3.50 quality-point index in course

* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, or prepared classroom work.

work is placed on the Dean's Honor List for that semester. Appearance on the list is limited to (1) full-time students registered for a minimum of 12 semester hours and (2) part-time students registered for a minimum of 12 semester hours over a period of two consecutive semesters, which may include a summer term.

ACADEMIC STANDING

A student whose cumulative quality-point index (QPI) is less than 2.0 but at least 1.0 any time after having enrolled in a minimum of 24 semester hours is placed on probation: "First Probation" for the initial semester, "Second Probation" if continued on probation for a second semester. For part-time students and those enrolled in summer sessions, a "semester" is interpreted to mean a time interval in which at least 12 semester hours have accrued. A student on probation is limited to no more than 13 semester hours of course work per semester.

A student who resumes a cumulative QPI of 2.0 or more after a first or second semester on probation is removed from probationary status. Failure to resume a cumulative QPI of 2.0 after two successive semesters on probation results in suspension. The Dean's Council may continue a student on probation if satisfactory progress is demonstrated during the probation period.

A student whose cumulative QPI falls below 1.0 any time after having enrolled in a minimum of 24 semester hours as a student in the School of International Affairs will be suspended.

Students who are suspended for poor scholarship may apply for readmission after the lapse of one fall or spring semester. To be considered for readmission, the student must submit evidence to the Dean's Council of conduct during absence from the University which indicates that the student will profit from readmission. A student suspended twice for poor scholarship will not be readmitted.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described under Regulations.

*Changing an Incomplete*—The grade of *I* must be changed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An Incomplete that is not changed within this period automatically becomes an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be changed by reregistering for the course here or by taking its equivalent elsewhere.

**Residence**

A minimum of 30 semester hours, including at least 12 hours in the major field, must be completed while registered in the School of International Affairs. This requirement applies to students transferring within the University as well as to students transferring from other institutions. Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior or final year must be completed in the School of International Affairs.

**Use of Correct English**

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplemen-

tary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up any such deficiency in English to the satisfaction of the dean.

### Regulations on Study Abroad

See Study Abroad, under Special Programs, page 163. Students are encouraged to travel and study abroad. Those wishing to study abroad must consult their academic advisor and the study-abroad advisor. Students must secure the dean's prior approval for any plan of study abroad if the credit earned is intended to apply to the degree program in which they are registered. A catalogue or other description of the foreign institution or study program must be presented for consideration together with detailed descriptions of the courses to be taken.

### Pass/No Pass Option

A student in the School of International Affairs who has a cumulative quality-point index of 2.5 or better may, with the approval of an advisor and the dean, take one course per semester and receive a grade of *P*, Pass, or *NP*, No Pass, which will be recorded on the student's transcript but will not be reflected in the cumulative grade average. A student must sign up for such an option at registration. Under no circumstances may a student change from pass/no pass status to graded status, or vice versa, after the end of registration. Courses in the student's major (except those in which the grade of *P* or *NP* is normally assigned) may not be taken on a pass/no pass basis. A transfer student may not elect to take a course on a pass/no pass basis until the second semester of enrollment in the University. Students in the School of International Affairs may take no more than six courses in which the grade of *P* or *NP* is assigned, including those in which the grade of *P* or *NP* is normally given and those taken in any other college, school, or division of the University prior to transferring to the School of International Affairs.

### Additional Requirements for the 90-Semester-Hour Program

Exceptional students may, when registered as freshmen or sophomores, petition the dean of the School of International Affairs for admission to a special 90-semester-hour degree program. Supporting evidence in the form of achievement test scores, College-Level Examination Placement (CLEP) scores, and grades earned at George Washington University or any other institution must be supplied. The dean, in consultation with the Dean's Council, will determine eligibility for admission to the program, which takes place when the student enters the beginning of the junior year.

The basic assumption of this program is that the student can waive at least 30 semester hours of freshman or introductory requirements.

In addition to the general and curriculum requirements, students in the 90-semester-hour program must fulfill the following requirements:

1. The student must receive grades of *A* in 50 percent of the total course work and in 50 percent of the courses required in the major.
2. The student must take at least 60 semester hours in courses beyond the first-group level (numbered above 100).
3. The 90 semester hours of credit must be earned in actual course work, i.e., credit through advanced placement, special examinations, etc., may not be counted in the 90 semester hours required for graduation.

Students who qualify for admission to the 90-semester-hour program are encouraged to begin taking second-group courses (numbered 101–200) as soon as they are qualified to do so and should seek to obtain a waiver of course prerequisites in those disciplines in which they have a strong background.

**Earning Credit or Waiving Requirements by Examination**

For information on earning credit by examination or waiving curriculum requirements, see the chair of the academic department concerned.

## CURRICULUM REQUIREMENTS

Curriculum requirements for the first two years are outlined below. Requirements for each major—International Affairs, Latin American Studies, East Asian Studies (China or Japan), and Middle Eastern Studies—are outlined under the appropriate heading in Courses of Instruction.

| | | Semester Hours |
|---|---|---|
| English: | Engl 9 or 10, and 11 or 12 | 6 |
| Humanities: | AmCv 71–72; Art 31–32 or 71–72; Clas 108, 113; *Literature (American, Chinese, East Asian, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group philosophy courses; Rel 1–2 | 6 |
| †Language: | Chinese, Japanese, French, German, Hebrew, Italian, Russian, or Spanish | 12–6 |
| Math/Science: | BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1, 2, 5, and 6, or 9–10; Stat 51, 53, or 91, and 105 or 129; 129, 130; 111, 112 | 6–8 |
| Social Science: | Econ 1–2; Hist 40 and 72; PSc 1, 2, and IAff 91‡ | 21 |
| §Elective: | | 3–9 |
| | Total | 60 |

## SECONDARY FIELDS OF STUDY

Students can take a Secondary Field of Study, such as business, economics, or languages, in other schools of the University. Students from other schools of the University can take a Secondary Field of Study in International Affairs in the School of International Affairs. See the brochure *Secondary Fields of Study* available in the Student Services Office or from the Vice President for Academic Affairs.

## THE DEGREE OF MASTER OF ARTS

The School offers degree programs leading to the Master of Arts in the fields of East Asian studies, international affairs, Latin American studies, Middle Eastern studies, Russian and East European studies, security policy studies, and science, technology, and public policy.

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* If a student elects 6 semester hours of literature in any foreign language, this cannot be used to satisfy the language requirement.
† Chin 5–6 is required for East Asian Studies (China focus) majors; Japn 3–4 is required for East Asian Studies (Japan focus) majors. Greek and Latin are not acceptable for International Affairs majors. Middle Eastern Studies majors may substitute other languages with the approval of the program advisor. Latin American Studies majors must include Spanish.
‡ IAff 91 is not required for the Middle Eastern Studies program.
§ Credit is not given for Exercise and Sport Activities courses.

## ADMISSION REQUIREMENTS

Application forms are available from the Office of Graduate Admissions, School of International Affairs, George Washington University, Washington, D.C. 20052. Admission is normally for the fall semester only. Applications for admission must be submitted by February 1 for the following fall semester. January 15 is the deadline for award applications and for admission applications from international students.

A bachelor's degree from an accredited college or university, with a *B* average or better, or the equivalent, in a relevant undergraduate major is normally required. If there is evidence of special promise, such as high Graduate Record Examination scores, an applicant whose academic record falls short of *B* will be given serious consideration. Scores on the General Test of the Graduate Record Examination as well as letters of recommendation are required.

*International Affairs*—The applicant's undergraduate program should include background courses corresponding to the undergraduate major in international affairs at this University or some other relevant social science program. In the case of major deficiencies in the social sciences or international relations, additional course work may be specified beyond the minimum requirements for the master's degree. The student's particular responsibilities will be indicated in the letter of admission to the program and in the course of subsequent consultation with an assigned faculty advisor.

*East Asian Studies*—An undergraduate major in a pertinent field is required. For the concentration in Chinese language and literature, the undergraduate program should include 24 semester hours of Chinese language study.

*Latin American Studies*—The applicant's undergraduate program should include background courses corresponding to an undergraduate major in Latin American Studies at this University, or equivalent. Majors in other fields may be considered for admission provided that undergraduate course work includes Spanish or Portuguese and sufficient course work in one of the following areas: anthropology, economics, geography and regional science, Hispanic literature, history, and political science.

*Middle Eastern Studies*—The applicant's undergraduate program should include background courses corresponding to an undergraduate major in Middle Eastern Studies at this University, or equivalent.

*Russian and East European Studies*—An undergraduate major in a pertinent field is required. The undergraduate program should include the following courses, or equivalent: Hist 145, 146; PSc 131 or 168; Slav 1–2 and 3–4 or 5–6.

*Science, Technology, and Public Policy*—Undergraduate majors in a social, life, or physical science, or in engineering are eligible for admission, although those lacking adequate preparation in relevant social sciences, particularly economics, may be required to take additional courses; such requirements will be indicated in the letter of admission to the program.

*Security Policy Studies*—An undergraduate background similar to that specified above for International Affairs would be appropriate. Working experience in the military or national security fields might compensate in part for inadequate academic preparation. A background in economics or quantitative analysis skills would also be helpful.

### Readmission

A graduate student who has not been continuously enrolled, or on approved leave of absence or inactive status, must file an application for readmission the semester before planning to return to school.

## GENERAL REQUIREMENTS

There are two options available in most programs leading to the Master of Arts degree. One option requires a minimum of 24 semester hours of approved graduate work plus the successful completion of a thesis; the student must register for 6 semester hours of Thesis Research (299–300). The second option requires a minimum of 36 semester hours of graduate course work and does not include a thesis. The Security Policy Studies program does not have a thesis option; the Chinese language and literature concentration of the East Asian Studies program requires the thesis option. Under both options, course work is taken in order to prepare for the Master's Comprehensive Examination.

Candidates for the degree of Master of Arts are required to submit an advisor-approved Plan of Studies (comprehensive fields, supporting course work, tool requirement, etc.) to the office of the dean by the end of the first semester in residence.

Master's degrees are awarded by vote of the Faculty after the student has completed the required course work and an acceptable thesis (if one is elected), has satisfied the foreign language or tool requirement, and has passed the Master's Comprehensive Examination.

Under special circumstances second-group courses (numbered 101–200) may be counted toward the master's degree when registration for graduate credit has been approved at the beginning of the course by the curriculum advisor, the instructor, and the dean. The student who takes an undergraduate course for graduate credit is expected, by arrangement with the instructor, to do work at the graduate level in addition to the regular work of the course. Normally, no more than 6 semester hours of second-group courses may be taken for graduate credit in the 30-semester-hour program, and no more than 9 semester hours may be taken for graduate credit in the 36-semester-hour program. (An exception to this rule is the case of students who select one or more fields in history; they may take 9 hours of second-group courses in the 30-hour program and 12 in the 36-hour program.) No work counted toward a bachelor's degree may also be counted toward a master's degree.

All master's degree candidates must complete degree requirements within five years of their admission to the program. A student who is unable temporarily to continue the plan of studies may request a leave of absence not to exceed one year. Extensions beyond the five-year period may be granted in exceptional circumstances, but the student will be required to register and pay for 6 credit hours of Reading and Research each semester.

No credit is granted for work done in absentia or without formal instruction, except for the thesis, which may be completed in absentia with the permission of the curriculum advisor and the dean. No more than 6 semester hours of graduate credit may be transferred from other accredited institutions or another division of the University, and these may be accepted only under limited conditions of time, grades, and relevance to the student's program.

### Curriculum Requirements

Curriculum requirements for the master's programs are listed under the appropriate heading in Courses of Instruction—International Affairs: East Asian Studies; Latin American Studies; Middle Eastern Studies; Russian and East European Studies; Science, Technology, and Public Policy; and Security Policy Studies.

### Tool Requirements

In most degree programs, a candidate for the degree of Master of Arts must

demonstrate a reading knowledge (certified by the relevant language department) of a modern foreign language that has an appropriate literature for the study of the field. Students in regional programs must demonstrate their ability in a language appropriate to the study of the specific region. If a student selects a language not offered by the University, a testing fee of $50 will be charged in order to compensate an outside examiner. A master's degree candidate whose native language is not English may select English to fulfill the requirement with the approval of the advisor and the dean. The examination, which will test high-level reading and writing proficiency, is administered by the English for International Students program.

Candidates in the fields of Security Policy Studies and Science, Technology, and Public Policy may substitute statistics for a foreign language. This requirement may be met by demonstration of proficiency (i.e., grades of *B* or better) at the level of Stat 105, 112, 183, or 197. The tool requirements of the Science, Technology, and Public Policy field may also be fulfilled by proficiency in PAd 296.

Candidates in International Affairs may petition the dean to substitute statistics for a foreign language. The primary basis for approving such petitions will be the relevance of the statistical skills to the student's thesis research.

The language or tool examination should normally be taken before the student has completed the first 15 hours of work; it must be taken before the comprehensive examination. No student may take the language or tool examination more than three times.

Courses taken to fulfill the tool requirement are not counted in the semester-hour requirement for a master's degree, nor may they be taken on a Pass/No Pass basis.

### Master's Comprehensive Examination

In addition to course examinations, the candidate must pass written Master's Comprehensive Examinations covering the chosen fields of study. Examinations are scheduled twice a year (in November and April) and should be taken during the last semester of course work or shortly after the completion of the prescribed course work. If there is a lapse of time between completion of course work and the examination, the student must be enrolled continuously during this period. It should be understood that course work constitutes only part of preparation for the Master's Comprehensive Examinations. Each student is expected to pursue a program of additional reading in each of the selected fields, in accordance with the advice of the faculty member responsible for instruction in that field. A student who fails to pass any part of the Master's Comprehensive Examination may, in exceptional circumstances, and with the approval of the department and the dean, repeat the examination at the next scheduled examination date. If the student fails a second time, no further opportunity to take the examination is permitted.

### Scholarship Requirements

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *CR*, Credit; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; and *Z*, Unauthorized Withdrawal.

Graduate students are required to maintain a minimum cumulative quality-point index (QPI) of 3.0. Students whose cumulative QPI falls below 3.0 at any time after having completed at least 9 semester hours will be given an additional semester in which to raise the QPI above 3.0. Those who fail to bring their QPI over 3.0 at the end of the additional semester will not be allowed to

continue in the program. For part-time students and those enrolled in summer sessions, a semester is interpreted to mean a time interval in which at least 9 semester hours have accrued.

A master's candidate who receives a grade of *F* is required to present cause for consideration by the Dean's Council as to why he or she should be allowed to continue in the program of studies.

Whenever a grade has not been assigned, the symbol *I* (Incomplete) or *W* (Authorized Withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work of the course. Except for thesis research courses, an Incomplete cannot be made up after the lapse of one calendar year. An Incomplete that is not made up by the end of one calendar year remains as a grade of *I* on the student's record. An Incomplete cannot be removed by reregistering for the course. No student will be permitted to register for courses or take the Comprehensive Examinations if there are more than two Incompletes outstanding on the record.

A student who fails to meet the established deadlines for completion of course work or other elements of the program (e.g., comprehensive examinations) and is granted an extension may be required by the dean and the Dean's Council to register for 3 credit hours of graduate Reading and Research for each semester that the work is delinquent.

### The Thesis

The thesis subject should be selected as early as possible so as to permit effective integration with the course work. A student will not be permitted to register for Thesis Research (IAff 299–300) until the thesis subject has been formally submitted to the Dean's Office. The subject must be approved by the member of the faculty under whom the thesis is to be written, a second member of the faculty who will serve as a reader, and the student's program director. The thesis in its final form must have the approval of the thesis director and one other reader, and two copies must be presented to the dean by the student no later than the date announced in the University Calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Dean's Office.

Payment of tuition for the thesis entitles the candidate, during the period of registration, to the advice and direction of the thesis director and the other reader. In case a thesis is unfinished, the student must maintain continuous enrollment and is allowed one calendar year to complete it. If the preparation of the thesis extends beyond the additional calendar year, the student must register for the entire 6 hours of thesis again and pay tuition as for a repeated course.

## SPECIAL PROGRAMS

### Joint Master of Arts and Juris Doctor Degree Program

The School of International Affairs cooperates with the National Law Center in offering a program of study leading to the degrees of Master of Arts and Juris Doctor. A student must be accepted for admission by both the School of International Affairs and the National Law Center. Applications should be made separately but at the same time. Both the School and the Center should be notified that the student is interested in the combined program. The student will be admitted to the School of International Affairs for the academic year following the first year of study at the National Law Center, since the National

Law Center stipulates that the first year of course work for the Juris Doctor degree must be taken as a unit.

The Master of Arts degree program normally consists of the 30-semester-hour program that includes a thesis. The student selects a major offered by the School and fulfills all of the requirements for the Master of Arts degree as well as fulfilling the requirements for the Juris Doctor degree. Up to 6 semester hours of credit for course work completed as part of the Juris Doctor curriculum and related to the student's degree program may be approved for transfer toward the Master of Arts degree. (Some of the course work required for the Master of Arts degree program may be applicable toward the Juris Doctor degree requirements.) Students will be registered in both the School of International Affairs and the National Law Center and must maintain this concurrent registration until all degree requirements have been completed. All work for this combined degree program must be completed in five years, unless an extension of time is granted by the dean.

### Institute for Sino-Soviet Studies

The Institute for Sino-Soviet Studies provides a program of specialized graduate study and research within the School of International Affairs. Courses of the Institute are drawn from a variety of academic areas and thus provide an interdisciplinary approach to the study of the Soviet Union, Eastern Europe and East Asia, and of the Communist movement within and among the countries of these areas. Faculty members conduct seminars and readings courses in the disciplines of economics, geography, history, language and literature, law, and political science. Research work is integrated with the teaching program.

The Institute's offerings are intended especially for students preparing for the Master of Arts in the fields of East Asian studies, international affairs, and Russian and East European studies, or in the fields of economics, history, or political science, with specialization in Sino-Soviet studies.

Doctoral candidates in political science will take their Sino-Soviet work in the form of appropriate subfields in preparation for the general examinations in their discipline; doctoral candidates in history are expected to take at least two of the four fields for the degree in the history of the countries of their specialization. All work leading to the degree of Doctor of Philosophy is under the general supervision of the Graduate School of Arts and Sciences. Consultative committees designated by the Graduate School direct the work of each student upon admission to degree candidacy. A faculty member of the Institute will serve as advisor to the candidate. The candidate's committee will be formed from members of the selected disciplinary department. Language requirements will depend upon the discipline of concentration. Candidates should consult the department in which they are taking their degree.

### Space Policy Institute

The George Washington University established the Space Policy Institute as a center of objective competence in an important area of national and international activity. The Institute focuses on policy issues related to civilian space activities and their interactions with national security space programs. It conducts research on space policy issues and organizes seminars, symposia, and conferences.

### Center for Advanced Studies of the Americas

George Washington University is a founding member of the Center for Advanced Studies of the Americas (CASA). The Center assists students interested

in inter-American affairs in taking advantage of Washington's wide-ranging resources in this field. The Center provides information on the full range of courses on Latin America that are offered by participating universities; internships in relevant international organizations, such as the Organization of American States and the Inter-American Development Bank; and activities and programs involving visiting Latin American scholars or diplomats.

A 12-credit certificate program in Latin American studies for graduate students in other fields is available through CASA.

**Study Abroad Programs**

The George Washington University Spring Semester Program in La Rochelle is designed primarily but not exclusively for Junior Year Abroad students specializing in international affairs and international business. The goal of the program is to give students an opportunity to study international relations and international business in France from French and European perspectives. Students select their program from five courses and an internship. All courses are taught entirely in French by faculty of the University of Poitiers and the Institut d'Etudes Françaises of La Rochelle. There is also a required one-month noncredit intensive French course stressing the language of government and business in preparation for the regular course offerings. Participating students must have a minimum grade-point average of 3.00.

The George Washington University in England Programs are student exchange programs between GWU and the Universities of East Anglia, Essex, Lancaster, and Manchester. They are designed to permit students of the participating universities to study for an academic year in the exchange university, while remaining enrolled for a degree at their home institution. The Programs are primarily, but not exclusively, intended for liberal arts students who are in their junior year and in good academic standing. Participating students should have a minimum grade-point average of 3.00.

Students in good academic standing, who will be sophomores or juniors at their proposed time of study abroad, may be eligible to participate in the George Washington University–American College in Paris Program, either for an academic year or for a spring semester. Qualified students will be encouraged to take this opportunity to profit from the cultural and intellectual riches of Europe by spending a period of time living and studying in Paris. A knowledge of French is desirable but not mandatory, as all courses except foreign languages and literatures are taught in English.

The George Washington University in Peru Program is a student exchange program between GWU and the Universidad Católica del Perú in Lima. It is designed to permit students of the two participating universities to study a variety of subjects for a semester or academic year in the exchange university, while remaining enrolled for a degree at their home institution. The Program is primarily, but not exclusively, intended for students specializing in Latin American studies. The Program is open to all GWU sophomores and juniors and graduate SIA students in good standing. Participating students should have a minimum grade point average of 3.00 and have a high proficiency in Spanish, since they are enrolled in regular university classes with Peruvian students.

Credits earned with acceptable grades will be transferable toward the appropriate degree at George Washington University, provided there is no duplication of work previously done. All programs of study abroad must be approved on the required forms by the appropriate faculty and administrative personnel before departure. More information on the programs in England, France, Peru, and Spain, and on other study-abroad programs, may be obtained from the Office of the Dean, School of International Affairs.

## DIVISION OF CONTINUING EDUCATION

*Dean* C.D. Holden
*Associate Dean* G.E. Jones
*Assistant Deans* J. Costantino, H.A. Little, B.J. Moreland, G.E. Schou, A.O. Smith

### INTRODUCTION

The Division of Continuing Education provides credit courses and continuing education programs by administering the off-campus programs of the college and schools of the University. The Division also sponsors noncredit courses, conferences and institutes, and seminars and workshops, as well as several certificate programs to meet the personal and continuing professional education needs of adults. Special programs of study may be developed in response to specific needs of the government and business communities. The Division includes a center designed to improve the flow of science communications information. The staff of instruction for Division programs includes members of the full-time faculty of the University and academically qualified part-time lecturers from the professional community.

The Division works closely with education directors, public school officials, and personnel administrators in government, business, and industry to develop courses of study for continuing education students. In cooperation with sponsoring groups from government and business, the Division offers courses at the Crystal City Education Center in Arlington, Virginia, and other off-campus locations in the District of Columbia and suburban Maryland and Northern Virginia. The Division also offers, through its Tidewater Center, graduate degree programs in various disciplines at locations in the Hampton, Norfolk, and Virginia Beach area. A wide range of conferences, seminars, and workshops is available to organizations and individuals from the professional community.

Any organization interested in having the Division organize and conduct a course or a comprehensive educational program should contact the Dean of the Division of Continuing Education.

The academic standards of the University are maintained in off-campus credit courses. The Division of Continuing Education is accredited by its regional accrediting agency, the Middle States Association of Colleges and Schools. All programs offered through the University's off-campus programs and administered by this Division are approved through the procedure authorized by the Board of Trustees and the Charter granted by the Congress of the United States. Degrees are granted through the faculties of the degree-granting schools and colleges of the University. Credit earned through off-campus study conforms to academic standards throughout the University. All Division off-campus offerings in Maryland are approved by the Maryland State Board for Higher Education; those in Virginia are approved by the Commonwealth of Virginia Council of Higher Education.

Except as outlined below, all general University regulations apply to students in the Division of Continuing Education. In addition, Division students may be subject to special requirements of the school or college through which they are taking courses.

### ADMISSION AS A DEGREE CANDIDATE IN OFF-CAMPUS PROGRAMS

Students wishing to be admitted as candidates in an off-campus degree program may obtain application forms from the school concerned, the Division

of Continuing Education, one of the University's off-campus representatives, or the education officer of their agency or installation.

## NONDEGREE STUDENTS

Off-campus credit courses may be taken by nondegree students who meet the prerequisites prescribed by the department concerned. Formal University admission is not required at the time of registration in off-campus courses.

## CHANGES IN PROGRAM OF STUDIES

*Dropping an Off-Campus Course*—A student may drop a course without academic penalty during the first third of the semester (first through fourth class meetings) by completing an Off-Campus Change Slip that has been signed by the instructor and submitting it to the appropriate University representative. Withdrawal from a course without academic penalty after this period requires approval of a written request accompanied by the completed change slip and submission to the appropriate dean.

A student must follow these procedures in order to drop any course. Notifying the instructor of the intention to drop a course does not constitute an official withdrawal. The instructor indicates on the change slip whether the student is passing. The effective date of withdrawal and decisions regarding refunds are determined by the appropriate dean. Failure to follow the proper procedure results in the recording of a failing grade and, regardless of the time of discontinuance, does not relieve the student of financial responsibility for the entire course. Off-Campus Change Slips may be obtained from the instructor, installation education office, or the Student Services office of the Division of Continuing Education.

## DEGREE PROGRAMS

The Graduate School of Arts and Sciences* offers the following degree programs off campus:

Master of Arts

*Fields and Concentrations:* administrative sciences, crime in commerce, criminal justice, legislative affairs, security management, telecommunications policy

Master of Forensic Sciences

The School of Engineering and Applied Science† offers the following degree programs off campus:

Master of Engineering Administration

Master of Science

*Major Fields:* electrical engineering (communications), computer science, information management, operations research

Professional Degrees (Engineer and Applied Scientist)

The School of Education and Human Development‡ offers the following degree programs off campus:

Master of Arts in Education and Human Development

*Major Fields:* curriculum and instruction, early childhood special education, higher education, human resource development, supervision and human relations, transitional special education

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* For program information, see the field concerned under Courses of Instruction.
† See the School of Engineering and Applied Science *Bulletin*.
‡ For program information, see the section of this *Bulletin* on the School concerned.

Master of Education
*Major Field:* secondary education
Education Specialist
*Major Fields:* administration, higher education, human resource development

The School of International Affairs* offers the following degree program off campus:
Master of Arts
*Major Fields:* security policy studies, Russian and East European studies

## DIVISION PROGRAMS

The Division of Continuing Education administers off-campus degree programs and the activities of the Center for Career Education and Workshops, the Office of University Students, the Office of Conferences and Institutes, and Science Communication Studies.

### CENTER FOR CAREER EDUCATION AND WORKSHOPS (CCEW)

CCEW provides a broad spectrum of services focusing on innovative, nontraditional, career-oriented education. Among CCEW programs are noncredit graduate-level career certificate programs to prepare the legal assistant, publication specialist, landscape designer, fund raising administrator, administrative manager, association executive, information systems specialist, public relations professional, and Washington representative. Other programs are designed to prepare the certified employee benefit specialist, certified financial planner, and credit administrator. Credit courses and test review courses (for CLEP, EIT, FSE, GMAT, GRE, LSAT, MAT, MCAT, and Basic Real Estate) are offered as well.

Workshops and short-term courses provide the opportunity for individuals to be informed of the innovations in their fields. Courses focus on advances in computer technology and train participants to increase personal effectiveness, improve managerial expertise, reinforce leadership ability, identify practical decision-making skills, broaden understanding of systems and concepts, and develop understanding of financial, political, and social strategies. The Professional Development Program, designed to enhance the skills, productivity, and job satisfaction of an organization's employees, can provide these workshops, credit courses, and noncredit courses on site or through interactive television.

CCEW offers four undergraduate certificate programs that combine academic credit courses offered by Columbian College of Arts and Sciences with skill development workshops. The programs include Supervisory Specialist, Communication Studies, Computer and Information Systems, and Writer and Editor.

The Center is the site of the University's Continuing Education for Women (CEW) program, which has provided counseling and educational services to women in transition since 1964. Participants benefit from many CEW programs, which currently include group and individual counseling services accredited by the International Association of Counseling Services, Inc. CEW also offers a series of special-interest courses focusing on issues confronting women. For a complete listing of services, courses, and programs, see the CCEW schedule of classes.

* For program information, see the field concerned under Courses of Instruction.

## OFFICE OF UNIVERSITY STUDENTS

The Office of University Students (OUS) makes on-campus credit courses available to those who are not currently degree candidates at this University. Such students, often employed in government or industry, may be taking courses to enhance their career potential or as a matter of personal interest. They may be candidates for higher degrees at other institutions, sent here for special work as part of a graduate program. They may be undergraduates matriculated elsewhere, taking courses for transfer to their own institution.

All courses except those restricted to medical and law students and those in the Departments of Accountancy, Business Administration, and Management Science are open to OUS students, provided they have sufficient preparation as determined by the academic departments. Students wishing to take engineering and applied science courses should consult the School of Engineering and Applied Science *Bulletin*.

Registration in a given course may be denied OUS students when space is needed for degree candidates. OUS students are not eligible to register for thesis or dissertation research nor for continuous enrollment or leave of absence. OUS requires a minimum registration of 3 semester hours per semester or session, except in special circumstances as approved by the dean.

### Entrance Requirements

An academic background appropriate for the program of studies contemplated is required. In addition, the applicant who has previously attended this or another college or university must be in good standing at that institution. An applicant who has been suspended from any educational institution for poor scholarship will not be considered for admission for one calendar year after the effective date of the suspension. An applicant who has been denied undergraduate admission within this University will not be considered for admission as a nondegree student for the same semester for which the application was denied.

Applications for admission through OUS for a fall or spring semester should be received in the Office of Admissions no later than the Friday before the first day of registration (see the Calendar, pages 5–7). Applications for admission for the summer should be submitted at least two working days prior to registration day. In both cases, however, applicants are urged to apply earlier. There is no application fee. For admission requirements for students from foreign institutions, see pages 24–25.

### Regulations

See Admissions, Registration, Fees and Financial Regulations, and Regulations. Prospective and registered students are urged to acquaint themselves with the regulations concerning attendance and withdrawal (pages 45 and 47). The following specifically apply to all students registered through OUS:

Last day to add a class for credit—end of second week of classes.

Last day to drop a class for credit or to withdraw from the University—end of the seventh week of classes.

Equivalent amounts of time apply to the summer sessions.

### ACADEMIC WORK LOAD

For OUS students, the normal academic work load during the regular academic year is not more than 10 semester hours for a student employed more than 20 hours per week and not more than 18 semester hours for a full-time student. During the summer a student may take a maximum of two courses during any one session. Exceptions to these limits must be approved by the dean.

### SCHOLARSHIP REQUIREMENTS

A student who fails to maintain the scholarship requirements of OUS may be dismissed from the University. A statement of scholarship requirements is available in the office of the dean.

All grades received in OUS remain on the record; scholarship requirements are based on the total record.

*Grades*—See page 45. There is no limitation on the number of courses that may be taken on a pass/no pass basis in OUS; however, there may be a limit on the number that can be transferred to fulfill degree requirements.

### INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) and *W* (Authorized Withdrawal) may be assigned are described on page 46.

*Changing an Incomplete*—The instructor normally sets a period (maximum of one year) within which the uncompleted work must be made up. An Incomplete that is not changed within one calendar year remains as a grade of *I* on the student's record.

### CHANGE IN PROGRAM OF STUDIES

*Change Within the Office of University Students*—A student may not change or drop courses (see Withdrawal, page 47) or change status to that of auditor except with the approval of the dean.

*Transfer Within the University*—Transfer to or from OUS may be made only with the approval of the deans concerned. Application for transfer to degree candidacy will be considered only after the completion of at least one semester in OUS or upon request from the college or school to which the student is seeking admission. Students wishing to transfer to degree candidacy must meet the conditions of the college or school to which they are applying. It is the responsibility of the student to consult the college or school concerning conditions to be met and the amount of work transferable.

## COLLEGE COURSES FOR SECONDARY SCHOOL STUDENTS

Under the auspices of the Office of University Students, well-qualified secondary school students may take fully accredited college courses in nondegree status at George Washington University. During the academic year, high school juniors and seniors residing in the Washington metropolitan area may enroll in GWU courses as part-time, commuting students. Through the Summer Scholar Program, precollege students may enroll in a wide variety of summer courses prior to their junior or senior year of high school. Summer Scholars from outside the Washington area reside on campus in a University residence hall. Local residents may choose to use on-campus housing but are not required to do so. The Summer Scholar Program offers diversified cultural, social, and recreational experiences under the supervision of resident advisors.

*Scholarships*—Secondary school students with outstanding academic records and excellent scores on standardized tests will be considered for full tuition scholarships. Because the awards are based on academic merit rather than financial need, only the application for admission and supporting credentials are required for consideration. The amounts awarded cover tuition only and cannot be applied to housing, meals, or fees.

For further information and an application, please write to the Coordinator, College Courses for Secondary School Students, Office of Admissions, George Washington University, Washington, D.C. 20052.

## OFFICE OF CONFERENCES AND INSTITUTES

Director Lu A. Kleppinger

The Office of Conferences and Institutes serves the University by planning, promoting, and administering conferences, institutes, and other noncredit activities cosponsored by the University's schools, academic departments, and centers or associations. Each event promotes the research, teaching, or public service activities of the faculty and/or the University. The Office of Conferences and Institutes provides budget planning, program development, marketing, and logistic support for eligible seminars, short courses, workshops, conferences, and institutes of all sizes, either on or off campus.

## SCIENCE COMMUNICATION STUDIES

Project Director F. Ronald Dutcher

The mission of Science Communication Studies is to improve the flow of scientific research information from those who generate it to those who apply it. Actively engaged in providing research and information services, SCS uses today's research tools—from conventional manual literature searches to computer systems—to collect, organize, analyze, and generate information. In addition, it develops new services and systems for access to technical literature in the biomedical and aerospace sciences. Activities include maintaining a database of publications related to space life sciences research; abstracting and indexing scientific literature; and preparing and publishing scientific manuscripts, bibliographic literature searches, critical analyses in life sciences, and newsletters. SCS educates and informs via publications, conferences, and other media; it does not offer courses.

## NONCREDIT COURSES AND PROGRAMS

In addition to the noncredit offerings of the Division, the University also offers a variety of noncredit professional development courses and programs through the School of Government and Business Administration (through its Continuing Professional Education Office), the School of Engineering and Applied Science (through its Continuing Engineering Education Program), and the School of Education and Human Development (through its Center for Research and Services).

# SUMMER SESSIONS

Courses are offered during the summer by all degree-granting divisions of the University: Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Medicine and Health Sciences, the National Law Center, the School of Engineering and Applied Science, the School of Education and Human Development, the School of Government and Business Administration, and the School of International Affairs. During the summer the University also offers special programs that are not available during the regular academic year. Courses are offered during both day and evening hours.

Students who are enrolled at the University for the spring semester may register for the following Summer Sessions without special application. All others must apply for admission or readmission. No application fee is charged

nondegree students. Those who wish degree status may seek admission from the appropriate college or school within the University. Those who do not wish to work toward a degree at the University may apply through the Office of University Students and are subject to its entrance requirements and regulations stated above.

For a complete statement concerning summer term work, see the *Summer Sessions Announcement*.

## RESEARCH CENTERS AND INSTITUTES

The University recognizes that research contributes significantly to the academic stature, achievement, and capability of the faculty in fulfilling their responsibilities as teachers and public servants. To that end, the University seeks to ensure the close integration of research and teaching, including the employment of students in sponsored projects and the use of research facilities for instructional purposes. The following units are presently chartered for these purposes; the head of each unit is indicated in parentheses.

Biostatistics Center (M. Halperin)
Center for Digestive, Liver, and Biliary Diseases (H. Fromm)
Center for High Technology (H. Liebowitz)
Center for Social Policy Studies (S. Levitan)
Center for the Study of Education and National Development (J. Boswell)
Center for Washington Area Studies (D. Gale)
Division of Research, Psychiatry, and Behavioral Sciences (D. Reiss)
ERIC Clearinghouse on Higher Education (J. Fife)
First Federal Congress Project (C. Bickford)
Graduate Institute for Policy Studies (A. Adams)
Graduate Program in Science, Technology, and Public Policy (J. Logsdon)
Industrial Relations Institute (B. Burdetsky)
Institute for Advanced Study of Immunology and Aging (A. Goldstein)
Institute for Artificial Intelligence (B. Silverman)
Institute for Disease Prevention (O. Alabaster)
Institute for Information Science and Technology (W. Kahn)
Institute for Management Science and Engineering (W. Marlow)
Institute for Medical Imaging and Image Analysis (R. Allman)
Institute for Reliability and Risk Analysis (N. Singpurwalla)
Institute for Sino-Soviet Studies (C. Linden)
Institute for the Study of Fatigue, Fracture, and Structural Reliability (H. Liebowitz)
Institute for Technology and Strategic Research (H. Liebowitz)
Intergovernmental Health Policy Project (R. Merritt)
International Water Resources Institute (V. Yevjevich)
Joint Institute for the Advancement of Flight Sciences (H. Liebowitz)
Lipid Research Clinic (J. LaRosa)
Medical Decision Center (R. Riegelman)
National Center for Innovation in Corrections (J. Schloegel)
National Health Policy Forum (J. Jones)
Rehabilitation Research and Training Center (D. Reiss)
Space Policy Institute (J. Logsdon)
Wilson Genetic Counseling Center (J. Larsen)

## COURSES OF INSTRUCTION

The following section provides listings and descriptions of courses offered by the departments of instruction and special interdepartmental programs. The courses as listed here are subject to change. The University reserves the right to withdraw any course announced or to change the course fees shown herein.

## HOURS OF INSTRUCTION

Classes are scheduled in the morning, afternoon, and evening. Evening and daytime sections of the same course are identical, are taught by the same staff of instructors, and carry the same amount of credit.

## EXPLANATION OF COURSE NUMBERS

*First-Group Courses*—Courses numbered 1–100 are planned for students in the freshman and sophomore years. With the approval of the advisor and the dean, they may also be taken by juniors and seniors. In certain instances, they may be taken by graduate students to make up undergraduate deficiencies or as prerequisites to advanced courses, but they may not be taken for graduate credit.

*Second-Group Courses*—Courses numbered 101–200 are planned for students in the junior and senior years. Except for accountancy courses, they may be taken for graduate credit only upon the approval of the Dean and the instructor at the time of registration. Such approval is granted only with the provision that students must complete additional work to receive graduate credit. Accountancy courses numbered 101–200 may not be taken for graduate credit.

*Third-Group Courses*—Courses numbered 201–300 in the Graduate School of Arts and Sciences, the School of Government and Business Administration, and the School of Education and Human Development are planned primarily for graduate students. They are open, with the approval of the instructor, to qualified seniors; they are not open to other undergraduates. Qualified seniors in the School of Government and Business Administration registering for these courses must have a 3.00 average, the prior approval of the department chairman who is responsible for the graduate course, and the prior approval of the dean. Nondegree students who have not completed a bachelor's degree may not enroll in graduate courses offered by the School of Government and Business Administration.

*Fourth-Group Courses*—Courses numbered 301–400 in the Graduate School of Arts and Sciences are limited to graduate students, but they are primarily for doctoral candidates. Courses numbered 301–400 in the School of Government and Business Administration are limited to doctoral students. In the School of Education and Human Development fourth-group courses, numbered 301–400, are limited to graduate students with master's degrees from accredited institutions.

*Fifth-Group Courses*—Courses numbered 701 and 721 represent an ongoing program of curriculum innovation at GWU. The 701 number is used to designate experimental courses taught by individual faculty members. The 721 number designates innovative interdepartmental courses. The 751 number is used to list courses sponsored jointly by two or more schools. Courses numbered in the 770s are taught by scholars who hold appointments as University Professors. The 700 numbers do not indicate the level of difficulty. Courses in this series range from freshman-level offerings to classes designed for seniors and graduate students. Unless the course description in the

*Schedule of Classes* indicates that there are prerequisites or that an interview with the instructor is required prior to registration, 700 courses are open to all interested students, subject to their advisor's approval and the rules of the respective colleges.

## KEY TO ABBREVIATIONS

The following abbreviations are used for course designations:

| | |
|---|---|
| **Accy** | Accountancy |
| **AdSc** | Administrative Sciences |
| **AHA** | Allied Health Administration |
| **AmCv** | American Civilization |
| **Anat** | Anatomy |
| **Anes** | Anesthesiology |
| **Anth** | Anthropology |
| **ApSc** | Applied Science |
| **Art** | Art |
| **ArTh** | Art Therapy |
| **AM** | Association Management |
| **Bioc** | Biochemistry |
| **BiSc** | Biological Sciences |
| **BAd** | Business Administration |
| **Cart** | Cartography |
| **Chem** | Chemistry |
| **CH&D** | Child Health and Development |
| **Chin** | Chinese |
| **CE** | Civil Engineering |
| **Clas** | Classics |
| **ClEn** | Clinical Engineering |
| **Comm** | Communication |
| **CpMd** | Computer Medicine |
| **CSci** | Computer Science |
| **Cnsl** | Counseling |
| **Derm** | Dermatology |
| **Econ** | Economics |
| **Educ** | Educational Leadership |
| **EPol** | Education Policy |
| **EE** | Electrical Engineering |
| **EMed** | Emergency Medicine |
| **EAd** | Engineering Administration |
| **EngS** | Engineering Science |
| **Engl** | English |
| **EFL** | English as a Foreign Language |
| **E&RP** | Environmental and Resource Policy |
| **EnHe** | Environmental Health |
| **Envr** | Environmental Studies |
| **ExSA** | Exercise and Sport Activities |
| **ForS** | Forensic Sciences |
| **Fren** | French |
| **Gnet** | Genetics |
| **Geog** | Geography and Regional Science |
| **Geol** | Geology |
| **Ger** | Germanic Languages and Literatures |
| **Gern** | Gerontology |
| **HCS** | Health Care Sciences |
| **HSA** | Health Services Administration |
| **Hist** | History |
| **HmKn** | Human Kinetics |
| **HRD** | Human Resource Development |
| **HmSr** | Human Services |
| **Hmn** | Humanities |
| **Idis** | Interdisciplinary Courses |
| **IAff** | International Affairs |
| **Ital** | Italian |
| **Japn** | Japanese |
| **Jour** | Journalism |
| **Kor** | Korean |
| **Law** | Law |
| **Libr** | Library |
| **Mgt** | Management Science |
| **Math** | Mathematics |
| **ME** | Mechanical Engineering |
| **Med** | Medicine |
| **Micr** | Microbiology |
| **MStd** | Museum Studies |
| **Mus** | Music |
| **NSc** | Naval Science |
| **NSur** | Neurological Surgery |
| **Neur** | Neurology |
| **Ob&G** | Obstetrics and Gynecology |
| **OR** | Operations Research |
| **Opht** | Ophthalmology |
| **Orth** | Orthopaedic Surgery |
| **Path** | Pathology |
| **Phar** | Pharmacology |
| **Phil** | Philosophy |
| **Phys** | Physics |
| **Phyl** | Physiology |
| **PCm** | Political Communications |
| **PSc** | Political Science |
| **Port** | Portuguese |
| **Pchi** | Psychiatry and Behavioral Sciences |
| **Psyc** | Psychology |
| **PAd** | Public Administration |
| **PubH** | Public Health |
| **PPol** | Public Policy |
| **Rad** | Radiology |
| **Rel** | Religion |
| **Rom** | Romance Literatures |
| **Rmn** | Romanian |
| **SLP** | Service–Learning Program |

| | |
|---|---|
| **Slav** | Slavic Languages and Literatures |
| **Soc** | Sociology |
| **Span** | Spanish |
| **SpEd** | Special Education |
| **SpHr** | Speech and Hearing |
| **Stat** | Statistics/Computer and Information Systems |
| **Surg** | Surgery |
| **TrEd** | Teacher Education |
| **TCom** | Telecommunications Policy |
| **TrDa** | Theatre and Dance |
| **T&T** | Travel and Tourism |
| **Univ** | University |
| **U&RP** | Urban and Regional Planning |
| **Urol** | Urology |
| **WStu** | Women's Studies |

## SEMESTER HOURS OF CREDIT

The number of semester hours of credit given for the satisfactory completion of a course is, in most cases, indicated in parentheses after the title of the course. Thus, a year course giving 3 semester hours of credit each semester is marked (3–3), and a semester course giving 3 semester hours of credit is marked (3). A semester hour may be defined as one 50-minute period of class work or one laboratory period a week for one semester.

## TIME OF COURSE OFFERINGS

Following most course descriptions is a parenthetical statement listing the semester (fall or spring) for which the course is scheduled. The term *academic year* is used only with two-semester courses and indicates that the first half of the course is to be offered in the fall semester and the second half in the spring semester. Not all offerings for the summer sessions are listed in this *Bulletin*. Students should consult the *Summer Sessions Announcement* for additional summer offerings. A *Schedule of Classes* is published each fall and spring semester to provide information concerning the time of course offerings.

# ACCOUNTANCY

Professors A.J. Mastro, F.C. Kurtz, C.M. Paik, M.G. Gallagher, J. Hilmy *(Chair)*, F.W. Segel
*Professorial Lecturers* S.M. Farag, P. Ben Ezra
*Associate Professor* D.R. Sheldon
*Assistant Professors* W.F. Thomas, K.E. Smith, L.C. Moersen, L.G. Singleton, B.C. Horn, S.N. Cory (Visiting)
*Assistant Professorial Lecturers* J.L. Eggleston, L.G. Jordan
*Instructor* P.R. Witmer

See the School of Government and Business Administration for programs of study in accountancy leading to the degrees of Bachelor of Accountancy, Master of Accountancy, Master of Taxation, and Doctor of Philosophy.

Accountancy courses numbered below 201 may not be taken for graduate credit. Accountancy courses numbered 201 and above may not be taken for undergraduate credit.

### First Group

**51 Introductory Financial Accounting (3)** Horn, Cory
Basic knowledge of financial accounting concepts and standards as an essential part of the decision-making process for the management of private investment and for business and government organizations. Students who have received credit for a similar financial accounting course cannot receive credit for Accy 51. (Fall and spring)

52 **Introductory Managerial Accounting** (3) Horn, Cory
Basic knowledge of managerial accounting concepts, procedures, analyses, and internal reports as an essential part of the decision-making process for public- and private-sector organizations. Prerequisite: Accy 51. Students who have received credit for a similar managerial accounting course cannot receive credit for Accy 52. (Fall and spring)

**Second Group**

101 **Cost and Budgetary Control** (3) Singleton
Cost behavior and volume–profit relationships, responsibility accounting, standard costs, cost structures for control and decision making, relevant costs, cost concepts, and variance analyses. Prerequisite: Accy 51–52. (Fall and spring)

111 **Financial Statement Analysis** (3) Hilmy
Analysis and interpretation of financial statements for the guidance of management, directors, stockholders, and creditors. Prerequisite: Accy 51–52. (Fall and spring)

121 **Intermediate Accounting** (3) Mastro
In-depth study of accounting functions and basic theory; acquisition of assets and services, income and equity accounting, preparation and analysis of financial statements. Prerequisite: Accy 51–52. (Fall)

132 **Accounting Theory** (3) Hilmy
Current thought as reflected in the pronouncements of leading professional and accounting research associations, major contributions to accounting literature. Prerequisite: Accy 121. (Spring)

151 **Business Law for Accountants I** (3) Moerser
An introduction to the legal process and business law concepts for the professional accountant. Contracts, sales, commercial papers, business torts, and property, with concern for professional accounting certification; the interrelationship of accounting standards, taxation concepts, and auditing standards with business law, and the legal liability and ethical standards of professional accountants. Prerequisite: Accy 51–52. (Fall)

152 **Business Law for Accountants II** (3) Moerser
A broadening of business law concepts—partnerships, corporations, agency, secured transactions, trusts, wills, insurance, and securities. Legislation and litigation of the professional accountant's liability as an auditor and tax advisor. The interrelationship of accounting standards, taxation concepts, and auditing standards with business law, and the legal liability and ethical standards of professional accountants. Prerequisite: Accy 151. (Spring)

161 **Federal Income Taxation: Individuals** (3) Smith
A study of federal income tax concepts with primary emphasis on individuals. Prerequisite: Accy 51–52. (Fall)

162 **Federal Income Taxation: Corporations, Partnerships, Estates, and Trusts** (3) Smith
Federal income tax concepts applicable to corporations, partnerships, estates and trusts; tax research and planning. Prerequisite: Accy 161. (Spring)

171 **Auditing** (3) Thomas
Principles and procedures of auditing: generally accepted auditing standards, internal control, audit objectives and reports, audit evidence, professional and legal responsibility, and audit of EDP systems. Prerequisite: Accy 121. (Fall)

181 **Accounting Systems** (3) Sevo
Data processing considerations in the design and operation of accounting systems. Principles of internal control applicable to manual and automated accounting systems. Prerequisite: Accy 101, 121. (Fall)

190 **Special Topics in Accounting** (3) Staff
Experimental offering; new course topics and teaching methods. Prerequisite: Department approval.

191 **Advanced Accounting** (3) Mastro
Application of accounting theory to special areas: consolidated statements, business combinations, earnings per share, foreign exchange, price-level adjusted statements, source and application of funds. Prerequisite: Accy 121. (Spring)

199 **Independent Study** (3) Staff
Assigned topics. Admission by permission of the Department Chairman. (Fall and spring)

**Third Group**

201 **Financial Accounting** (3) Kurtz, Singleton
The role of accounting in the decision-making process of external parties; the understanding, interpretation, and implementation of financial accounting. (Course equivalent: a similar graduate financial accounting course, or Accy 51–52, or two similar undergraduate courses.) (Fall and spring)

202 **Management Accounting** (3) Paik
The role of accounting in the decision-making processes of management; understanding of how accounting influences resource allocation decisions in the organization. Prerequisite: Accy 201. (Fall and spring)

211 **Business Law for Accountants** (3) Moersen
A study of the legal process and the principles and precepts of business law within the context of the political and legal environment of business. Corporations, partnerships, securities, the debtor–creditor relationship, trusts, wills, and the legal liability and ethical standards of the accountant. (Fall and spring)

221 **Cost and Budget Analysis** (3) Sheldon
An advanced cost analysis course, with emphasis on comparative costs, quantitative techniques for cost data, managerial reporting systems, and manufacturing efficiency studies. Prerequisite: Accy 201 and 202. (Spring)

225 **Financial Reporting Standards** (3) Segel, Sheldon
A critical understanding of the Financial Accounting Standards Board Pronouncements (Standards) and the Security and Exchange Commission–Accounting Series Releases. Prerequisite: Accy 201 and 202. (Fall and spring)

242 **Business Income Taxation** (3) Gallagher
Federal tax concepts applicable to individuals, partnerships, fiduciaries, and corporations; emphasis on recognition of tax consequences attached to common business transactions and on tax planning. Not open to Master of Accountancy or Master of Taxation candidates. (Fall and spring)

251 **Accounting for Multinational Corporations** (3) Hilmy
A study of international accounting standards with emphasis on accounting for foreign conversion requirements compatible with domestic accounting consolidation standards. Prerequisite: Accy 201. (Fall and spring)

255 **Business Combinations and Not-for-Profit Organizations** (3) Hilmy
Corporate concepts, business combination policies, including FASB, SEC, AICPA business combination pronouncements. Structure analysis of combined and consolidated financial statements; accounting for not-for-profit and governmental organizations. Prerequisite or (with approval of instructor) concurrent registration: Accy 225. (Fall)

260 **Tax Research and Planning** (3) Smith
A study of the legislative, administrative, and judicial sources of federal tax

law. Emphasis on the use of tax research tools in locating, interpreting, and communicating tax law and on the complementary relationship between legal research and quantitative decision making. Prerequisite or concurrent registration: Accy 261. (Fall)

261 **Federal Income Taxation** (3) Gallagher
A study of federal income taxation, covering gross income, deductions and credits, sales and other disposition of property, capital gains and losses, and timing. (Fall and spring)

262 **Federal Income Taxation of Partnerships** (3) Smith
Federal income taxation of partnerships; formation, operation, distribution, and transfer of partnership interests. Prerequisite: Accy 261. (Spring)

263 **Federal Income Taxation of Corporations** (3) Gallagher
A study of federal income taxation of "C" and "S" corporations, covering formation, capital structure, nonliquidating distributions, complete liquidations, corporate accumulations, and the alternative minimum tax. Prerequisite or concurrent registration: Accy 261. (Fall and spring)

264 **Federal Taxation of Estates and Gifts** (3) Smith
A study of estates, gifts, and trusts covering gross estates, state transfer taxes, valuation problems, planning estate liquidity, complex trusts. Prerequisite: Accy 261. (Spring)

265 **Tax Practice and Procedure** (3) Smith
A study of federal tax practice and procedure, including organization of the IRS, ethical responsibilities, statute of limitations, examination of returns, claims for refund, penalties, and tax rulings. Prerequisite or concurrent registration: Accy 261. (Fall)

266 **Corporate Reorganizations and Affiliations** (3) Smith, Gallagher
Advanced study of corporate taxation: corporate reorganizations, multiple corporations, consolidated returns, and carryover of tax attributes. Prerequisite: Accy 263. (Spring)

267 **Estate Planning** (3) Gallagher, Smith
Selected studies in estate and financial planning, with emphasis on estate, gift, and income tax considerations. Prerequisite: Accy 264. (Fall)

268 **Deferred Compensation** (3) Gallagher, Smith
A study of tax aspects of deferred compensation arrangements, including qualified pension, profit-sharing, and stock bonus plans; retirement plans for self-employed individuals; individual retirement accounts; and stock options. Prerequisite or concurrent registration: Accy 261. (Spring)

275 **Contemporary Auditing Theory** (3) Kurtz, Thomas
Study of advanced independent (external) and internal auditing concepts, operational auditing, application of statistical sampling to auditing, audit of electronic data processing systems, computer applications, ethics. Prerequisite: Accy 225. (Spring)

282 **Accounting Information Systems and EDP** (3) Segel
Development and application of accounting system theory, including analysis, design, and implementation. Integration of electronic data processing, accounting systems, and management information systems. Prerequisite: Accy 201. (Fall)

290 **Special Topics in Accounting** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated once for credit. (Fall and spring)

297 **Professional Accountancy and Business/Government Policy** (3) Sheldon, Mastro
A study of the development process of professional accounting standards through examination of the socioeconomic, political, legal, and management process. Management policy concerns for alternatives in the selection of accounting standards. Prerequisite: Master of Accountancy or Master of

Taxation status. This course must be taken during the last semester of the program and will not be waived. (Fall and spring)

298 **Directed Readings and Research in Accounting** (3) Staff

**Fourth Group**

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. The courses are open to selected master's students upon petition approved by the Associate Dean.

311–12 **Seminar: Public–Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society. Prerequisite: doctoral degree candidate status.

391 **Doctoral Seminar in Accounting** (arr.) Sheldon, Paik
Reasoning and research in technical areas of accounting; theoretical issues and their application to practice; conceptual themes in professional literature; comparative accounting research analyses. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to doctoral candidates preparing for the general examination. May be repeated for credit.

399 **Dissertation Research** (arr.) Staff
Limited to doctoral candidates. May be repeated for credit.

## ADMINISTRATIVE SCIENCES—GRADUATE PROGRAM

**Academic Committee:** J. Zeidner *(Director)*, K. Hamel, J.R. Harrald, B. Hodges, J.N. Mosél

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degree of Master of Arts in the field of administrative sciences. The program has been designed for public and private sector professionals who wish to increase their managerial competence and to improve their career potential. The program provides knowledge and skills in the social, behavioral, quantitative, and information sciences.

*Master of Arts in the field of administrative sciences*—Prerequisite: a bachelor's degree with a *B* average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. There is no thesis requirement. AdSc 221, Econ 217, OR 233, Psyc 244, and Stat 104 constitute the core curriculum. A student may specialize in Management Information Systems, Human Resources Management, or Organizational Management. The Management Information Systems track requires AdSc 201, 202, 203, 205, 206, 219, and 225. The Human Resources Management track requires AdSc 211, 212, 213, 214, 220, 222, and 223. The requirements for the Organizational Management track are Psyc 245, 246, and 260; AdSc 215, 216, 217, and 240. All students must pass a Master's Comprehensive Examination.

201 **Principles of Management Information Systems** (3)
An overview of the Management Information Systems specialty track. Integration of management, information, and systems concepts into a unified framework. Relationship of structure and organizational objectives to information, systems, and management. General systems theory: open, closed, deterministic, and probabilistic systems; interface, independence; decoupling and integration; feedback loops. Information theory: data vs. information, the value of information, redundancy, summarizing and filtering. Management information systems development, design, implementation, and evaluation strategies. Prerequisite: AdSc 221.

202 **Database Management and Operating Systems** (3)
Fundamental concepts of operating systems and database management systems that serve as the foundation for information system design and development. Technological framework for design and implementation of a computerized management information system. Hardware and software configuration, design strategies and alternatives, and analytical techniques. Operating systems, dynamic storage management, virtual memory process management, control languages, and systems routines. Applications of data-and-file structuring approaches. Database management systems use and analysis. Prerequisite: AdSc 201 and the administrative sciences core curriculum except OR 233.

203 **Data Communications and Networking**
Advanced concepts in analysis and development of computer-based information systems. Network, structures, design, and management. Distributed data processing techniques and local and network design; development of telecommunication procedures, including forms of communication, transmission media, communication software. Applications of file and report-writing facilities in microcomputer and mainframe environments. Comparison of alternative implementation strategies used in the design of management decision-making systems. Prerequisite: AdSc 201 and the administrative sciences core curriculum except OR 233.

205 **Decision Support Systems** (3)
Analysis and comparison of existing frameworks, techniques, and tools for assisting management in the decision-making process. Overview of alternative approaches (e.g., centralized vs. decentralized control) to the design, development, and implementation of decision support systems. Hardware and software limitations of alternative approaches, focusing on anticipated future technological improvements. Introduction to computer-based decision-making aids and simulations. Contemporary issues and problems in effective implementation of decision support systems. Prerequisite: AdSc 202, 203; OR 233.

206 **Artificial Intelligence and Expert Systems** (3)
An introduction to the principles of artificial intelligence, including its practical applications in robotics, natural language programs, and advanced computer input–output devices. Review and analysis of various expert systems, including tools and generators, classification vs. diagnostic type systems, and building modules. Examination of the design of expert systems, including development of the knowledge base and role of the knowledge engineer. Prerequisite: AdSc 202 and 203.

211 **Psychology of Personnel Management** (3)
An overview of the Human Resources Management specialty track. An examination, from a psychological systems perspective, of a unified human resources management program, including integration of human resources planning, job analysis, employee selection, placement, training, performance evaluation, compensation management, and management information systems. Analysis of the psychological theories underlying major personnel systems.

212 **Current Issues in Personnel Testing and Selection** (3)
An overview of psychometric, legal, and organizational issues in personnel employment testing and selection, with emphasis on reliability and validity of selection instruments and the utility of selection systems. Analysis of the legal environment, including test fairness in selection, adverse impact, and statistical models of test fairness and specific selection techniques, such as the employment interview, psychological tests, work samples, and assessment centers. Prerequisite: Stat 104 and AdSc 211.

213 **Managerial Leadership, Motivation, and Work** (3)
Application of the scientific study of leadership to the managerial environ

ment. Analysis of leadership behavior and managerial activities. Synthesis of major theories of leadership, including trait, behavior, situational, and power–influence. Synthesis of motivational theories, including acognitive and cognitive perspectives. Application of theories at various levels of formal organizations beyond the interpersonal perspective. Prerequisite: AdSc 211.

214 **Personnel Training and Performance Appraisal Systems** (3)
Analysis of training and appraisal techniques in contemporary organizations. Training topics include development of management training programs and training evaluation techniques. Appraisal topics include development of performance appraisal techniques, evaluation of appraisal systems, maintenance of relationship of rewards to performance, and the appraisal interview. Analysis of training and rating systems that satisfy legal requirements and stimulate employee productivity. Prerequisite: AdSc 212.

215 **Current Issues in Organizational Design** (3)
Analytical framework for the design of complex organizations, including the hierarchical bureaucratic, functional, and matrix structures. Examination of organizational technologies, control and boundaries, including design approaches emanating from Europe, Japan, and the United States, drawing on system theory and moving toward broader organizational design issues.

216 **Theories and Management of Planned Change** (3)
A systems view of organizational change and development, including intervention strategies, data collection diagnosis, and the integration and management of system-wide organizational change.

217 **Productivity and Human Performance** (3)
Definitions and measurement of individual, team, and organizational productivity, effectiveness, and efficiency. Models for the analysis of organizational and individual productivity and productivity growth in industrialized nations.

218 **Design of User–Computer Interface** (3)
Study of user-computer interaction. Presentation of the theoretical bases of user-computer interaction, along with integration of research findings into guidelines for systems developers and users. Information processing topics include input, storage and retrieval, display, dialogue. Interaction topics include environmental factors, user variables, help functions, system design, and multiple users. Prerequisite: AdSc 201.

219 **Information Security and Policy** (3)
Computer fraud and effective countermeasures for computer system security. The social and legal environment of information systems, including data privacy and ethics in database management. Information access policy, data security, contracts. Antitrust and other business implications of policies, transborder data flow, technology transfer, electronic funds transfer systems, mail, criminal justice information systems, cross-cultural differences, computer infringement of copyright, and protection of property rights in software. Prerequisite: AdSc 202, 203.

220 **Organizational Decision Making** (3)
Examination of processes in organizational decision making: the state of theory; research and applications for the practicing manager. Topics include managerial style and decision making, problem discovery and diagnosis, search for the design of solution, evaluation and choice, group decision making, decision aids and support systems, performance and decision effectiveness, and risk analysis and decision making. Prerequisite: AdSc 211.

221 **Introduction to Computers, Programming, and Information Systems** (3)
Introductory concepts in computer hardware, computer architecture, and software and management information systems. Information systems principles, including data processing applications, data communications, database management, and operating systems. Principles of good programming style, expression, and documentation. Introduction to program structures, struc-

tured modularization, structured programming concepts; stepwise refinement and top-down programming. Computer-based utilization of MIS for planning, control, and decision-making functions.

222 **Theory and Practice of Compensation Management** (3)
Analysis of contemporary compensation systems from both theoretical and practical perspectives, including the latest decisions of courts and regulatory agencies. Examination of motivational theories of pay, determinants and effects of salary structures on performance, incentive plans, and managerial compensation systems. Prerequisite: AdSc 214.

223 **Collective Bargaining** (3)
Analysis of federal and state employee relations laws and regulations. Topics include the bargaining environment, wage and benefit issues in arbitration, arbitration of grievances, and employee relations in non-union organizations. Behavioral theories of labor negotiations. Prerequisite: AdSc 222.

225 **Management Information Systems Development** (3)
The capstone course of the MIS track. Individual and team working experience in the actual design, development, implementation, and evaluation of a computerized management information system. Synthesis of organizational and technological aspects of development of information systems, with emphasis on needs assessment, organizational structures, and comprehensive evaluation techniques. Utilization of micro and mainframe environments in the design of the project.

240 **Corporate Policy and Social Responsibility** (3)
Examination of the process of policy analysis, development, and implementation. Analysis of policy mechanisms, including technology assessment, research and development, regulatory and control mechanisms. Illustrative examples of policy issues and problems drawn from government and industry, covering a broad range of substantive areas.

295 **Directed Research in Administrative Sciences** (arr.)
Supervised research in selected fields within Administrative Sciences. Admission by prior permission of faculty advisor and sponsoring instructor.

298 **Directed Readings in Administrative Sciences** (arr.)
Supervised readings in selected fields within Administrative Sciences. Admission by prior permission of faculty advisor and instructor.

## AMERICAN STUDIES PROGRAM

*University Professor* M.F. Cunliffe
*Professors* R.H. Walker, Jr., C.C. Mondale, B.M. Mergen, H.F. Gillette, Jr. *(Director)*
*Adjunct Professor* F. Gutheim
*Professorial Lecturers* L. Miller, W.E. Washburn
*Associate Professors* J.O. Horton, J.M. Vlach, R.W. Longstreth
*Adjunct Associate Professor* P.J. Cressey
*Assistant Professor* P.M. Palmer
*Assistant Professorial Lecturer* B.G. Carson

**Affiliated Programs**
Library of Congress
Smithsonian Institution

**Undergraduate Faculty Advisory Committee**
H.F. Gillette, Jr. *(Chair)*, C.J. Deering, F.S. Grubar, P.P. Hill, R.L. Humphrey, J. Moreno, C. Seavey, R.W. Stephens, D.D. Wallace, Jr., A.M. Yezer

**Graduate Committee**
W.H. Becker, M.F. Cunliffe, H.F. Gillette, Jr., J.O. Horton, H.L. LeBlanc, R.W. Longstreth, B.M. Mergen, C.C. Mondale, P.M. Palmer, L.P. Ribuffo, C.W. Sten, J.M. Vlach, D.D. Wallace, Jr., R.H. Walker

*Bachelor of Arts with a major in American civilization (field-of-study)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite course—AmCv 71–72. Other introductory courses as needed for upper-division courses in a discipline as described below.
3. An American studies core, which may be obtained by taking AmCv 167, AmCv/Hist 171–72, and at least 9 hours chosen from AmCv/Hist 771, AmCv/Engl/Hist 772, AmCv/Engl 160, 161, 162; also expected is a specialized focus, normally developed through at least 12 hours of second-group courses in a discipline or theme chosen so as to provide a structured approach to the range of American civilization (accepted approaches include sociology, history, literature, history of art and architecture, political science, philosophy and religion, gender studies, urban studies). The proseminar, AmCv 179–80, should be taken in the last full year of residence in preparation for the comprehensive examination that covers the core courses and special discipline or theme.

Special Honors will be awarded to students who fulfill the requirements for the major with a grade point average of 3.5 or better in the required courses and 3.0 or better overall and who receive honors on the comprehensive examination.

At least two years of a foreign language and knowledge of statistics and computer programming in the humanities and social sciences is strongly recommended. Students must consult at least once a semester with their American studies advisor.

*Minor in American civilization*—Requirements are 18 hours of 100-level courses, including AmCv 167 and AmCv/Hist 171–72 plus 9 hours chosen from the following two options: (1) AmCv/Hist 771, AmCv/Engl/Hist 772, AmCv/Engl 160, 161, 162; (2) related courses in American civilization, such as topics in urbanism, gender, black culture, folklife, philosophy and religion, literature, art and/or architecture.

*Master of Arts in the field of American civilization*—Prerequisite: the degree of Bachelor of Arts in American civilization or a related field.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) AmCv 271–72; (2) 18 semester hours chosen in a carefully related pattern of study of American civilization; (3) a comprehensive examination covering general competence in American civilization and the candidate's area of concentration; (4) a thesis (6 semester hours) written on a topic approved by the student's advisor; (5) successful completion of a reading knowledge examination in an approved foreign language. Special options in the master's degree program include the following:

1. *A concentration in material culture*—Course emphasis on the use of artifacts in historical research in association with the Smithsonian Institution. Required in addition to the general requirements outlined above, AmCv 250. Recommended: courses in decorative arts, architectural history, historical archaeology, history of technology, and history of art.
2. *A concentration in historic preservation*—Course emphasis on interpreting issues in historic preservation through a humanistic framework. Prerequisite: a course in American architectural history. Required: in addition to the general requirements outlined above, 36 semester hours, including 12 hours of courses recommended by the departmental advisor (including AmCv 271–72); AmCv 277–78; 12 hours recommended by the director of the historic preservation program; 6 hours of thesis supervision.
3. *A concentration in folklife*—Course emphasis on the expressive culture of American folk societies and theories and methods for its evaluation and interpretation. Required: in addition to the general requirements outlined above, AmCv 254, 257. Strongly recommended: additional course work on topics related to folklife, such as regionalism, oral history, material culture, vernacular architecture, and social and cultural history.

*Doctor of Philosophy in the field of American civilization*—This program combines work in the humanities and/or social sciences as preparation for research and teaching, with the option of stressing preparation for museum and library careers. Applicants are required to have an adequate background in the humanities and/or social sciences as they apply to the understanding of American civilization.

Required: the general requirements stated under the Graduate School of Arts and Sciences and successful completion of a reading knowledge examination in an approved foreign language. Candidates must pass a General Examination in four areas within three calendar years of matriculation. American cultural history is the only required field. Three other fields are elected with approval of the advisory committee; one field must represent foreign coverage. Other areas may be chosen from the following groups: (1) American diplomatic, economic, political, social, or urban history; folklife, literature, art, philosophy, or religion; Afro-American history; historic preservation; or some areas of the social and behavioral sciences; (2) in affiliation with the Library of Congress—supervised historical study in bibliographic resources including American history and politics, cartography, cross-cultural studies, government documents, graphic arts and music, motion pictures and recorded sound, printing and bookmaking; (3) in affiliation with the Smithsonian Institution—supervised studies including aerospace history, decorative arts, ethnohistory, history of science, history of technology, industrial archaeology, material aspects of American civilization, and various fields in the history of art. Additional areas of study may be arranged within the University and in both the Library of Congress and Smithsonian cooperative programs. Special announcements concerning these programs are issued periodically and are available in the office of the Director of the American Studies Program.

Research fields for the dissertation may be chosen from any of the above except those dealing with the culture of an area outside the United States.

### First Group

50 **Washington, D.C.: History, Culture, and Politics** (3) — Gillette and Interdisciplinary Teams
Introduction to interdisciplinary methods of studying the contemporary city. Major problems of metropolitan life, past and present, analyzed by faculty and community leaders. Emphasis on experiential team projects. Same as Hist/PSc/U&RP 50. (Fall)

71–72 **Introduction to American Civilization** (3–3) — Gillette, Vlach
Themes and issues in American civilization since Colonial times, with emphasis on their contemporary importance. (Academic year)

### Second Group

115 **Field Program in Mesoamerican Archaeology and History** (3 or 6) — Humphrey, Mergen
Joint offering of the American Studies Program and the Department of Anthropology. Field study in Mexico and Central America. (Summer)

160 **Early American Literature and Culture** (3) — Seavey
Same as Engl 160.

161 **American Romanticism** (3) — Stein
Same as Engl 161.

162 **American Realism** (3) — Romines
Same as Engl 162.

165–66 **Introduction to Folklore** (3–3) — Vlach
Forms of folk expression, including verbal, art, music, dance, and material culture. AmCv 165: The materials and methods of folklore research. AmCv 166: The folk cultures of the United States—Native Americans, Euro-Americans, Afro-Americans. Same as Anth 165–66. (Academic year)

167 **Themes in U.S. Cultural History** (3) — Gillette
An examination of the special ideas, values, and modes of expression that have made American life distinctive, as revealed through a variety of sources including fiction, popular media, photography and the arts, and material culture. (Spring)

171–72 **U.S. Social History** (3–3) Horton
Same as Hist 171–72.

173 **Afro-American History** (3) Horton
Survey of the Afro-American experience, emphasizing the contributions of black Americans to, and their impact upon, American history. Same as Hist 173. (Fall)

174 **Afro-American Literature** (3) Staff
Study of texts representing the experience of black Americans and the ideas and social forces that have shaped their lives and writings. Same as Engl 174.

175–76 **American Architecture** (3–3) Longstreth
Examination of selected topics in American architecture from the 17th century to the present. Stylistic properties, form and type characteristics, technological developments, and urbanistic patterns are introduced as a means of interpretation of historic meaning. Buildings are analyzed both as artifacts and as signifiers of social, cultural, and economic tendencies. U&RP/AmCv 175: 1600–1860; U&RP/AmCv 176: 1860–present. Same as Art 176 and 191. (Academic year)

177 **Introduction to Historic Preservation** (3) Gale
Washington, D.C., will be the primary exhibit for the study of historic preservation as it has developed over the past century. Experience with preservation issues as shown by examples in other localities will also be discussed. Lectures, class discussions of the readings, and field trips to neighborhoods and sites subjected to preservation efforts. Same as U&RP 177. (Spring)

179–80 **Proseminar in American Civilization** (3–3) Mondale
Coordinating course for seniors majoring in American Civilization. (Academic year)

184 **Contemporary American Civilization** (3) Staff
Examination of the patterns of contemporary American life through study of literature, the arts, and political, social, cultural, and economic trends.

185 **History of Women in America** (3) DePauw
Same as Hist 185.

186 **U.S. Urban History** (3) Gillette
History of the American city from colonial foundations to the present, focusing on relationships between social and economic forces with physical form. Special emphasis on transitions from pre-industrial to industrial to metropolitan forms, with attention to implications for public policy and historic preservation. Same as Hist 186. (Fall)

192 **The American Cinema** (3) Mergen
History and criticism of American films. The course will enable the student to recognize and evaluate cinema techniques, to express the evaluation clearly in writing, and to understand the role of films in the context of American culture. Same as Art 192. (Spring and summer)

193 **Field and Laboratory Research in Archaeology** (3) Cressey
Joint offering of the American Studies Program and the Anthropology Department. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording photography, preservation, stratigraphy and environmental reconstruction, typology, use–wear analysis, and spatial analysis. Specific research area and topics announced in the *Schedule of Classes*. (Summer)

194 **Introduction to Historical Archaeology** (3) Cressey
Joint offering of the American Studies Program and the Anthropology Department. Survey of the basic data and methods of research in the material culture of recent history. (Spring)

195 **Independent Study** (3) Staff
Open to a limited number of American Civilization majors as directed research or as an internship with a Washington museum or historical society. Approval of advisor required. (Fall and spring)

197 **Oral History and Interview Techniques** (3) Mergen, Gillette
Introduction to theory and practice of obtaining and using historical data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area. Same as Anth/Hist 197. (Fall or spring)

198 **Special Topics in American Studies** (3) Staff
May be repeated for credit provided the topic differs. Admission by permission of instructor.

**Third Group**

225 **History of Washington, D.C.** (3) Gillette
The social history of Washington, from village to metropolis, with emphasis through field trips on the evolution of residential neighborhoods and related issues of historic preservation and conservation. Same as Hist 225. (Spring)

254 **Folklore Theory** (3) Vlach
An intellectual history of American folklore research; analysis of particular theories and methods. Same as Anth 254. (Spring)

257 **Seminar: American Folklife** (3) Vlach
Research and discussion on the traditional cultures of various geographical regions of the United States. Analysis of folk art, craft, and architecture, regional and ethnic identities. Same as Anth 257. (Fall)

259 **Topics in American Folklife** (3) Staff
A seminar devoted to a variety of subjects related to folklore and folklife, such as public sector folklife policy, folk music, oral literature, or ethnic folklore and culture. The specific topic will be determined by the interests of available faculty and the curriculum needs of the folklife program. May be repeated for credit. Same as Anth 259.

260 **Women in the American Work Force** (3) Palmer
Joint offering of the American Studies Program and the Women's Studies Program. Multidisciplinary analysis of women's role in the labor force and gender-based division of labor. Views of women's work in the home and outside it; interrelationships of women in and out of the work force; class, race, and ethnic differences. (Spring)

271–72 **Seminar: Scope and Methods in American Studies** (3–3) Mondale
Consideration of American studies as an area for research and teaching, introduction to bibliography. Required of candidates for the degree of Master of Arts in the field of American civilization. (Academic year)

277–78 **Historic Preservation: Principles and Methods** (3–3) Longstreth
Joint offering of the American Studies Program and the Urban and Regional Planning Department. Same as Hist 277–78. Exploration of scope and purpose of the preservation movement in the United States with focus on developments from the 1960s to the present. Topics covered include the emergence of preservation theories in the 19th century, relationships between attitudes toward the past and toward design, the intent and impact of legislation, organizational dynamics, approaches to documentation, the concept of significance, and preservation as an instrument of change. Discussions with representatives of organizations and public agencies supplement class lectures. (Academic year)

286 **Interpretation in the Historic House Museum** (3) Staff
Same as Educ 286.

289–90 **Seminar: Topics in American Civilization** (3–3)
Research problems selected by the instructor. Preparation in American

cultural history or other area appropriate to the topic of the seminar. (Academic year)

294 **Field and Laboratory Research in Archaeology** (3) Cressey
Joint offering of the American Studies Program and the Anthropology Department. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording photography, preservation, stratigraphy and environmental reconstruction, typology, use–wear analysis, and spatial analysis. Specific research area and topics announced in the *Schedule of Classes*. May be repeated for credit. Same fieldwork as AmCv 193 but with additional readings and research required. (Summer)

295 **Independent Study** (arr.) Staff
Limited to master's candidates. Written permission of instructor required. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

**Fourth Group**

351 **Vernacular Architecture** (3) Vlach
Examination of selected regional and ethnic traditions in American building. Survey and field techniques, comparative study of related types of objects, and use of documentary sources. (Spring)

379–80 **Readings in American Cultural History** (3–3) Mergen, Walker
For students preparing for the Doctor of Philosophy general examination in the field of American civilization. (Academic year)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## COURSES OFFERED IN AFFILIATION WITH THE LIBRARY OF CONGRESS

The Graduate School of Arts and Sciences is affiliated with the Library of Congress in a program leading to the degree of Doctor of Philosophy. The following courses are offered at the Library of Congress by members of its staff.

**Third Group**

255–56 **Research Orientation Seminar: Americana in the Library of Congress** (3–3) Walker
Examination of major themes in American civilization as they relate to the collections of the Library of Congress. Full-year course with direct exposure to Library staff and materials. May be taken either as a conventional seminar culminating in a research paper or as preparation for a doctoral reading field, "Research Materials for the Study of American Life, Their Content, Collection, Arrangement, and Use." (Alternate academic years)

**Fourth Group**

355–56 **Practicum: Advanced Library Research** (3–3)
Practical problems in control of library materials with emphasis on collections in the Library of Congress. A reading field in the affiliated program. Prerequisite: AmCv 255–56. (Academic year)

389 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Library of Congress. May be repeated for credit. (Fall and spring)

390 **Dissertation Research** (arr.)
For Doctor of Philosophy candidates preparing dissertations based upon or significantly related to collections of the Library of Congress. Supervised by specialists at the Library. Prerequisite: AmCv 355–56. (Fall and spring)

## COURSES OFFERED IN AFFILIATION WITH THE SMITHSONIAN INSTITUTION

The Graduate School of Arts and Sciences is affiliated with the Smithsonian Institution's Program for Graduate Students in the History of American Civilization. The following courses are offered at the National Museum of American History and at the National Portrait Gallery by members of their staffs.

### Third Group

250 **Orientation Course: Material Aspects of American Civilization** (3) Washburn, Mergen
Familiarization with the historical collections of the Smithsonian Institution and introduction to opportunities for research and publication based on historical objects. Required of all students in the master's and doctoral programs affiliated with the Smithsonian Institution. (Fall)

251 **Museum Research and Education** (3) Washburn and Staff
Supervised work and/or study under the direction of Smithsonian staff members and research associates—museum visitor behavior, costumes and furnishings, decorative arts, and photography as historical documentation. (Fall and spring)

252–53 **American Decorative Arts** (3–3) Carson
Concepts of visual recognition and evaluation of surviving domestic artifacts from the 17th, 18th, and 19th centuries, including those made of wood, clay, glass, metal, and cloth. AmCv 252 is prerequisite to AmCv 253. (Academic year)

284 **Seminar: Studies in American Art and History** (3) Miller
Joint offering of the American Studies Program and the Art Department. Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. May be repeated for credit.

285 **Technology, Labor, and American Society** (3) Mergen
Selected readings on the interrelations among technology, labor, and society in the United States.

### Fourth Group

352 **Research in Selected Aspects of American Civilization** (3)
Supervised study and/or fieldwork in selected subject areas related to the activities of the Smithsonian Institution. (Fall or spring)

394 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Smithsonian Institution. May be repeated for credit. (Fall and spring)

395 **Dissertation Research** (arr.)
For Doctor of Philosophy candidates preparing dissertations significantly related to the material aspects of American civilization. Students work under curatorial supervision at the Smithsonian Institution. May be repeated for credit. (Fall and spring)

## ANATOMY—DOCTORAL PROGRAM

*Professors* F.D. Allan, T.N. Johnson, R.S. Snell *(Chair)*, E.N. Albert, M.J. Koering, K.E. Johnson
*Associate Professors* F.J. Slaby, R.J. Walsh, K.D. Peusner, J.M. Rosenstein, R.C. Bohn

*Doctor of Philosophy in the field of anatomy*—Required: The general requirements stated under the Graduate School of Arts and Sciences. Candidates must demonstrate proficiency in biostatistics and computer science. There will be a comprehensive written and oral examination that will cover at least three areas of anatomical studies.

*Research fields:* cell ultrastructure, embryology, gross anatomy, histology, neuroanatomy, and physical anthropology.

Faculty approval is required for all courses.

202 **Gross Anatomy** (6) Snell and Staff
Regional dissections of adult cadaver supplemented with lectures and x-rays. Laboratory fee, $30. (Fall)

203 **Human Developmental Anatomy** (1) K. Johnson
Origin and development of human body: emphasis on study of human development in interpreting anatomical anomalies. (Fall)

204 **Neuroanatomy** (2) T. Johnson
Gross and microscopic anatomy of central nervous system and special senses. Laboratory fee, $13.

205 **Human Microscopic Anatomy** (3) Koering and Staff
Microscopic structure of cells, tissues, and organs of the human body. Laboratory fee, $20. (Fall)

208 **Comparative Vertebrate Neurology** (1) T. Johnson
Survey of the evolution of the vertebrate brain. Prerequisite: Anat 204. Laboratory fee, $10. (Spring)

209 **The Use of Audiovisual Techniques in Anatomy** (2) Allan
Preparation of a significant audiovisual program about some aspect of human anatomy. Laboratory fee, $20. (Spring)

212 **Neurobiology** (3) Staff
An integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory. Same as Phyl 212. Laboratory fee, $25.

221–22 **Seminar** (1–1) Walsh
Research reports and discussions of special topics by guest lecturers, staff, and students. (Academic year)

249 **Introduction to Anatomical Research** (1) Staff
Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)

252 **Physical Anthropology** (1) Staff
Variations in humans and factors affecting them; human evolution and racial differences; anatomy and culture of ancient humans. (Spring)

253 **Brain-Tissue Interactions** (1) Walsh, Rosenstein
Interactions of the central nervous system with the muscular, sensory, and endocrine systems. Student presentations and clinical aspects. Prerequisite: Anat Phyl 212. (Spring)

254 **Fetal Anatomy** (2) Allan
Dissection of midgestational fetus. Comparison of fetal and adult structures. Limited enrollment. Laboratory fee, $10. (Spring)

256 **Teratology** (1) K. Johnson
Introduction to teratologic principles and techniques, with emphasis on experimental design. Limited enrollment.

260 **Electron Microscopy in Cellular Biology—Lecture** (1) Koering
Introduction to the morphology of the cell and its relationship to electron microscopic techniques. (Spring)

261 **Electron Microscopy** (4) Koering
Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration: Anat 260. Laboratory fee, $25. (Spring)

262 **Gross Anatomy of Upper and Lower Extremities** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

264 **Gross Anatomy of Head and Neck** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

266 **Gross Anatomy of Thorax and Abdomen** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

268 **Gross Anatomy of Pelvis, Perineum, and Lower Extremity** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

270 **Dissection of the Human Brain** (1) T. Johnson
Dissection of major pathways and nuclei of the brain with consideration of ventricular system; conferences and assigned reading. Limited enrollment Laboratory fee, $10. (Spring)

272 **Autonomic Nervous System** (1) Allan
Development, microscopic and gross anatomy, function of central and peripheral components of autonomic nervous system, with clinical consideration (Spring)

275 **Advanced Human Embryology** (1) Allan
Microscopic examination of the human embryo at several critical periods during embryogenesis. Limited enrollment. (Spring)

276 **Advanced Studies in Anatomy** (1) Staff
Lectures and conferences on selected anatomical subspecialties—endocrinology, teratology, growth, and others. May be repeated for credit. (Spring)

277 **Special Topics in Neuroanatomy** (3) Bohn, Peusner, Rosenstein, Walsh
Selected topics regarding the structural and functional organization of the nervous system. May be repeated for credit. (Spring—alternate years)

288 **Surface Anatomy and Radiology** (1) Snell
Lectures and demonstrations on areas of clinical importance. (Spring)

289 **Biochemical and Morphological Techniques in Cell Biology** (3) Slaby
The application of biochemical and electron micrographic techniques used in cell biology research. Limited enrollment.

295 **Research** (arr.) Staff
Content differs each time course is offered; may be repeated once for credit. Fee to be arranged. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## ANTHROPOLOGY

*Professors* R.K. Lewis *(Emeritus)*, R.M. Krulfeld, R.L. Humphrey, Jr., V.K. Golla.
*Professorial Lecturer* A. Franklin
*Associate Professors* S.L. Simons *(Chair)*, A.S. Brooks, C.J. Allen
*Adjunct Associate Professors* C.R. Rose, P.J. Cressey
*Associate Professorial Lecturers* S. Hertz, G. Teleki, Jr., J.E. Yellen
*Assistant Professor* D. Caro
*Assistant Professorial Lecturer* R.K. Evans
*Lecturer* A.G. Webster

*Bachelor of Arts with a major in anthropology (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Anth 1, 2, and 3.
3. Required courses in other areas—(a) 12 semester hours, or equivalent, of introduc-

tory French, German, Russian, or Spanish (or another major language approved by the Anthropology Department); (b) 6–12 semester hours of course work in related departments. Recommended for ethnological emphasis are courses in economics, political science, psychology, and sociology; for archaeological emphasis, courses in American civilization, art history, geography and regional science, geology, and history; for emphasis in physical anthropology, courses in anatomy and biological sciences. Courses in philosophy and statistics are strongly recommended for all anthropology majors.

4. Requirements for the major—24–36 semester hours in second-group anthropology courses, including Anth 101 and at least one course from each of the following four categories: aspects of culture (courses numbered in the 150s and 199 and 200), linguistics (161, 162, 168, or 169), ethnology (courses numbered in the 170s), and physical anthropology or archaeology (courses numbered in the 180s). Students intending to pursue a graduate degree in anthropology should take Anth 157 and at least one course each in archaeology and physical anthropology. Qualified seniors may enroll in 200-level seminar courses with the permission of the instructor. Up to 6 semester hours of ethnographic or archaeological field school credit may be accepted and applied toward the major, if approved by the department, and majors are encouraged to participate in such summer programs. Opportunities also exist for field and laboratory research during the academic year, both within the department and elsewhere in the Washington area. Credit for such work (not to exceed one-quarter of the student's total second-group credit hours in anthropology) may be granted through registration in Anth 195. Candidates for graduation with Special Honors must register for 3 semester hours of Anth 195, Undergraduate Research, and write a paper of special distinction arising out of a program of directed reading or research.

*Bachelor of Arts with a major in classical archaeology and anthropology (departmental)*—An interdepartmental major offered by the Anthropology and Art Departments. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult a departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the natural and mathematical sciences.)

2. Required courses in other areas: 6 semester hours, or equivalent, of introductory French, German, Latin, Greek, or a Near Eastern language. A second year of language study is strongly encouraged. Since graduate study in archaeology usually involves broader preparation, especially in languages, students intending to pursue graduate study should consult with the departmental advisor as early as possible in their undergraduate programs.

3. Required courses in the major: Anth 3, 183, 184, and one course chosen from Anth 152, 158, 177, or an approved 3-hour course in field work; four courses chosen from Art 101, 102, 103, 112, 155; two courses chosen from Clas 71, 72, 108, 113, 170; two courses chosen from Hist 107, 108, 109, 110 (students electing Hist 108 should previously have completed Hist 107 or 109).

*Minor in general anthropology*—21 credit hours are required, including Anth 1, 2, 3, 101, and three additional courses in anthropology, no more than two of which may be taken in the same subdiscipline. (For the purposes of this minor, the department's second-group courses may be divided into subdisciplines as follows: biological anthropology—Anth 186, 187, and 188; archaeology—Anth 182, 183, 184, 185, 190, and 194; anthropological linguistics—Anth 161, 162, 168, and 169; sociocultural anthropology—all other second-group courses, with the exception of Anth 195, 196, and 198, in which the topic is variable.)

*Minor in archaeology*—18 credit hours are required, including Anth 3, four courses chosen from Anth 182, 183, 184, 185, 190, and 194; an approved field or research course or a fifth course chosen from the preceding list.

*Minor in biological anthropology*—15–18 credit hours are required, including Anth 1, 186, 187, and 188, an approved field or research course or an approved course or course sequence in a related field (including biological sciences, geology, psychology, statistics, and certain other disciplines).

*Minor in sociocultural anthropology*—18 credit hours are required, including Anth 2 and 101; one course in ethnography (Anth 170–179); Anth 151 or 152; Anth 156 or 157; one course chosen from Anth 150, 153, 155, 158, 159, or 200.

*Minor in cross-cultural communication*—18 credit hours are required, including Anth 2, 161, 162; Anth 150 or 159; one course in ethnography (Anth 170–179); one course chosen from Anth 153, 155, 158, 163, 165, or 168. Psyc 115 is recommended.

*Master of Arts in the field of anthropology*—Prerequisite: a bachelor's degree; a major in anthropology is preferred but not mandatory. The undergraduate program should have included courses above the introductory level in anthropological theory, social organization, linguistics, archaeology, and physical anthropology. Students with less background in anthropology may be admitted but may be required to take one or more undergraduate courses to make up deficiencies before beginning the degree program.

1. *General degree*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The minimum requirement consists of 24 semester hours of approved graduate course work, plus a thesis (equivalent to 6 semester hours). A thesis is preferred; under certain circumstances, however, the department may permit a program of study consisting of 36 semester hours of approved course work without a thesis. At least 6 semester hours drawn from the sequence Anth 201, 202, 203, 204 should be included in the program of study and should be completed during the first 24 semester hours of graduate course work. For students with fewer than four undergraduate semesters of one major foreign language, a reading knowledge examination in a major foreign language must be passed before beginning the third semester of graduate work. A written general Master's Comprehensive Examination must be passed before beginning the 28th semester hour of graduate work.

2. *With a concentration in museum training*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study is the same as that described for the general degree, above, with the following exceptions: the minimum requirement consists of 36 semester hours of approved graduate course work and must include from 12 to 15 semester hours of work in museum-related courses, 6 semester hours of which may be in an internship. Museum training students may substitute for the foreign language reading examination an appropriate course in chemistry or photography, if approved by the department. No thesis is required, but students are expected to submit to the department at least one research paper of publishable quality on a museum-related topic. Students whose primary interest is in museum techniques, rather than anthropology, are advised to apply to the master's program in museum studies (see Museum Studies).

3. *With a concentration in development*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study is the same as that described for the general degree, with the following exceptions: this is a 36-credit-hour nonthesis program, including 6–9 hours in development anthropology (Anth 220, 221, 222), 18–21 hours in other anthropology courses, and 6–9 hours in economics and economic development. In some circumstances a thesis may be allowed. The program is designed to improve the student's understanding of complex development problems such as economic change, population, health, education, migration, and ecology, within an anthropological framework. A limited number of internships will be available in public and private development agencies in the Washington area.

4. *With a concentration in folklife*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study is the same as that described for the general degree, with the following exceptions: this is a 30-credit-hour thesis program consisting of 24 hours of anthropology, including 6 hours of folklore courses (Anth/AmCv 254 and 257). In some circumstances a 36-credit-hour nonthesis program may be allowed.

*Master of Science and Doctor of Philosophy in the field of geobiology*—see Geobiology

**First Group**

1 **Introduction to Biological Anthropology** (3) Brooks and Staff
Survey of human evolution, genetics and physical variation, and primatology. Frequent laboratory exercises. Laboratory fee, $15. (Fall and spring)

2 **Introduction to Sociocultural Anthropology** (3) Allen, Caro, Golla, Krulfeld, and Simons
Survey of the world's cultures, illustrating the principles of cultural behavior. (Fall and spring)

3 **Introduction to Archaeology** (3) Humphrey, Brooks
Introduction to archaeological survey and excavation techniques and laboratory methods of dating and analysis. Brief history of archaeology and survey of world prehistory. Films and laboratory exercises. (Fall and spring)

**Second Group**

101 **Survey of Anthropological Theory** (3) Allen, Krulfeld, Golla
The development of anthropological thought as seen in historical context. Exploration of selected basic concepts and theories of contemporary anthropology. Prerequisite: Anth 2 and 3. (Fall)

115 **Field Program in Mesoamerican Archaeology and History** (3 or 6) Humphrey, Mergen
Joint offering of the American Studies Program and the Department of Anthropology. Field study of archaeological and historical sites in Mexico and Central America. (Summer)

150 **Comparative Value Systems** (3) Krulfeld
World views, conceptual systems, and value orientations of representative cultures throughout the world.

151 **Comparative Economic Systems** (3) Krulfeld
The cross-cultural analysis of economic organizations, including hunters and gatherers, herders, cultivators, and peasants; the relationship of economy to ecology and to other aspects of culture; and the impact of the outside world on these economies.

152 **Man, Culture, and Environment** (3) Humphrey
Basic principles of cultural ecology. Human interaction with the ecosystem both past and present; emphasis on the application of anthropological precepts to current environmental problems.

153 **Psychological Anthropology** (3) Simons
Relevance of psychological theories to human evolution and the cross-cultural study of personality. Cultural determinants of personality formation and mental health. Prerequisite: Anth 2 or permission of instructor. (Spring)

154 **Anthropology, Drama, and the Human Experience** (3) Garner, Allen
A comparative approach to the meaning of humanity in different cultural traditions. Examination of the role of drama in daily life in its secular and ritual forms and contexts in which it is developed for conscious goals. Through improvisation workshops, students explore how the techniques of anthropology and drama can lead to a better understanding of the significance of specific actions and events and of human experience. Same as TrDa 140.

155 **Religion, Myth, and Magic** (3) Simons, Allen
Theories of religion developed by anthropologists; survey of world religions with emphasis on preliterate societies; religious processes and change. Same as Rel 155. (Spring)

156 **Comparative Political and Legal Systems** (3) Caro, Hertz
Comparative analysis of political systems, including bands, tribes, chiefdoms, and states, political processes such as factionalism, styles of leadership, and political ritual; primitive warfare; law. Prerequisite: Anth 2 or permission of instructor. (Spring)

157 **Comparative Kinship and Social Structure** (3) Simons, Allen, Hertz
Comparative analysis of social patterns and roles in kinship, economic and

political organization. Emphasis on preliterate societies, with some attention to complex systems. Prerequisite: Anth 2 or permission of instructor. (Fall) Krulfeld, Humphrey, Allen

158 **Art and Culture** (3)
The art of tribal society, including the role of art in culture, influences upon the artist, and beliefs and practices associated with art production. Allen

159 **Symbol, Cognition, and Society** (3)
The study of culture through the analysis of symbolic systems including myth, cosmology, folklore, art, ritual, political symbolism, and the symbolic study of kinship. Prerequisite: Anth 2 or permission of instructor. (Fall, odd years) Golla

161 **Language and Culture** (3)
Varieties of linguistic structure; the interrelationship of language and culture; the origin and evolution of human language; cultural and social implications of literacy. (Fall) Golla

162 **Language and Society** (3)
Linguistic variation and change; social and political correlates of linguistic differences; language in history. (Spring) Staff

163 **Anthropology of Visual Communication** (3)
Still and motion-picture photography as an integral aspect of anthropological research. A study of recent and historic ethnographic films and an introduction to the forms and methods of making visual ethnographic records. Prerequisite: Anth 2 or permission of instructor. Material fee, $15. Vlach

165–66 **Introduction to Folklore** (3–3)
Same as AmCv 165–66. Golla

168 **Methods of Linguistic Analysis** (3)
Phonetics, grammatical analysis, principles of lexicography, techniques of linguistic reconstruction, and other tools of anthropological linguistic research. (Fall) Golla

169 **Intensive Study of a Language** (3)
Analytic study of a selected language, ordinarily one not frequently studied in a university context (such as an American Indian language), as an illustration of the methods of anthropological linguistics. Prerequisite: Anth 168. (Spring or summer) Lewis, Caro

170 **Cultures of the Caribbean** (3)
Culture history and ways of life among the area's various cultural groups up to the ethnographic present. Prerequisite: Anth 2 or permission of instructor. (Summer) Simons, Humphrey, Golla

171 **Native Peoples of North America** (3)
Comparative study of Indian groups representative of each of the continent's culture areas. Prerequisite: Anth 2 or permission of instructor. (Fall) Allen, Caro

172 **Cultures of South America** (3)
Comparative study of native American, Iberian, and African cultures of South America and their interactions. Emphasis on world view, interethnic relations, and culture change. Prerequisite: Anth 2 or permission of instructor. (Fall) Lewis

173 **Cultures of the Pacific** (3)
Culture history and ways of life among native peoples of Melanesia, Micronesia, and Polynesia. Prerequisite: Anth 2 or permission of instructor. (Fall, odd years) Humphrey, Krulfeld, and Staff

175 **Topics in Asian and Circumpolar Ethnography** (3)
Intensive, integrated study of a selected culture area in or around Asia (including Circumpolar regions). Specific area to be announced in the *Schedule of Classes*. May be repeated for credit. Prerequisite: Anth 2 or permission of instructor. Lewis

177 **Cultures of the Near East** (3)
Geographic environment, language, religion, and social structure of settled

and nomadic peoples of the Near East: emphasis on the Arab world. Prerequisite: Anth 2 or permission of instructor. (Spring)

178 **Cultures of Africa** (3) Lewis, Caro
Comparative examination of the history, cultural development, and contemporary problems of sub-Saharan African cultures. Prerequisite: Anth 2 or permission of instructor.

182 **New World Archaeology** (3) Humphrey
Introduction to archaeological methodology and theory; survey of North American culture history from human entry into the Americas during the Pleistocene period until the time of the first European contacts. Prerequisite: Anth 3 or permission of instructor. (Spring)

183–84 **Old World Prehistory** (3–3) Brooks, Evans
Survey of human prehistory in Europe, Africa, and Asia from the earliest hominid cultures to the beginnings of advanced civilizations. Anth 183: Paleolithic and Mesolithic cultures. Anth 184: Neolithic and Bronze Age cultures. Prerequisite: Anth 3. (Academic year)

185 **Latin American Archaeology** (3) Humphrey, Allen, Caro
Culture history of pre-Columbian Latin America from the Paleo-Indian period through the Spanish Conquest. Focus on Andean South America in even years, on Mesoamerica in odd years. May be repeated for credit. Prerequisite: Anth 3 or permission of instructor.

186 **Physical Anthropology of Modern Man** (3) Ubelaker
An overview of human variation, with special emphasis on the skeleton. Includes history of physical anthropology, individual and population variations, archeological recovery of human remains, paleodemography, growth, paleopathology, and forensic anthropology. Prerequisite: Anth 1. (Spring)

187 **Introduction to Hominid Evolution** (3) Brooks
The fossil record of hominid evolution considered in the light of evolutionary theory. Brief review of the earlier human antecedents, with concentration on the Pleistocene remains. Prerequisite: Anth 1. (Spring, even years)

188 **Primatology** (3) Teleki
Physical and behavioral characteristics of the various primate groups and their relationship to human physical and cultural evolution. Frequent meetings at the National Zoological Park. Prerequisite: Anth 1. (Fall)

190 **Ethnohistory** (3) Allen, Humphrey, Caro
Reconstruction of the history of a selected preliterate society through the analysis of historical documents, oral traditions, archaeological remains, and other indirect sources. Specific topic to be announced in the *Schedule of Classes*. Same as Hist 190.

193 **Field and Laboratory Research in Archaeology** (3) Cressey
Joint offering of the American Studies Program and the Anthropology Department. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording photography, preservation, stratigraphy and environmental reconstruction, typology, use–wear analysis, and spatial analysis. Specific research area and topics announced in the *Schedule of Classes*.

194 **Introduction to Historical Archaeology** (3) Cressey
Joint offering of the American Studies Program and the Anthropology Department. Survey of the basic data and methods of research in the material culture of recent history. (Spring)

195 **Undergraduate Research** (arr.) Staff
Individual research problems to be arranged with a member of the faculty. May be repeated for credit. Prerequisite: Appropriate introductory course or permission of instructor.

196 **Special Topics in Anthropology** (3) Staff
Courses offered by visiting faculty; experimental offerings. Topic to be announced in the *Schedule of Classes*. May be repeated for credit. Prerequisite: Anth 2 or permission of instructor.

197 **Oral History and Interview Techniques** (3) Staff
Same as AmCv/Hist 197.

198 **Senior Seminar** (3)
Study and discussion of selected major works in anthropology. Prerequisite: Anth 101 and senior standing in anthropology. Staff

199 **Techniques of Field Research** (3)
Training in the development of skills necessary for different field situations, urban and rural, at home and abroad, in developing techniques of observation, participation, and documentation, as well as skills in handling practical field situations and problems. Intended primarily for those intending to do field research in the United States or abroad but useful to anyone likely to be living or working in a foreign culture. Prerequisite: Anth 2 or permission of instructor. Krulfeld

200 **Methods in Sociocultural Anthropology** (3)
Approaches to library and field research. Conceptual bases and biases in the delineation of problems and in the selection, analysis, and organization of data. Students will design and carry out their own field projects in the Washington area. Prerequisite: Anth 2 or permission of instructor. (Spring)

**Third Group**

201 **Proseminar: Biological Anthropology** (3) Brooks, Gordon
Theories, methods, and current issues in the various subdisciplines of biological anthropology. (Spring)

202 **Proseminar: Sociocultural Anthropology** (3) Krulfeld, Allis
Major topics in contemporary social and cultural anthropology, stressing current journal and monograph materials. (Spring)

203 **Proseminar: Anthropological Linguistics** (3) Golla
Contemporary anthropological studies of language in biological, social, and historical perspectives. (Fall)

204 **Proseminar: Method and Theory in Archaeology** (3) Humphrey, Brook
Survey of the most recent archaeological techniques and theoretical approaches to reconstructing and interpreting the cultures of the past. (Fa

211 **Seminar: Problems in Conservation** (3) Rose
Joint offering of the Anthropology and Art Departments. Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite or concurrent registration: Art or Anth 212. (Fa

212 **Advanced Conservation Techniques** (3) Rose
Joint offering of the Anthropology and Art Departments. Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying techniques used to conserve these materials. Prerequisite: Art or Anth 293, Chem 50, and permission of instructor. (Fall)

220 **The Anthropology of Development** (3) Krulfeld, Car
The role of anthropology in development; emphasis on theoretical perspectives that distinguish the unique contribution of anthropology to understanding processes of change in Third World societies. Issues include land reform, ecological impact, agricultural and pastoral systems, women's roles, migration, political institutions, and proletarianization. The role of anthropology in planning, feasibility studies, and implementation of development projects and policy. (Fall).

221 **Key Variables in the Development Process** (3) Caro, Krulfeld
Major factors required for anthropologists' development work in the areas of population, education, agriculture, irrigation, forestry, nutrition, health care, migration and resettlement, marketing, and communications. Isolation and study of the major variables and processes in each area to aid in successful planning, feasibility study, implementation and evaluation. (Spring)

222 **Issues in Development** (3) Krulfeld, Caro
Topic to be announced in the *Schedule of Classes*.

254 **Folklore Theory** (3) Vlach
Same as AmCv 254.

255 **Anthropology, Education, and the Museum** (3) Staff
The role of anthropology in education and museums. Emphasis on current anthropological research and on innovative museum and classroom techniques and materials. Seminars and teaching demonstrations at museums and laboratories.

257 **Seminar: American Folklife** (3) Vlach
Same as AmCv 257.

258 **Seminar: Anthropology of Art, Aesthetics, and Symbolism** (3) Allen, Krulfeld
Anthropological approaches to aesthetic problems and theories of symbolism in the context of ethnographic materials.

259 **Topics in American Folklife** (3) Staff
A seminar devoted to a variety of subjects related to folklore and folklife, such as public-sector folklife policy, folk music, oral literature, or ethnic folklore and culture. The specific topic will be determined by the interests of available faculty and the curriculum needs of the folklife program. Same as AmCv 259.

260 **Seminar: Culture Theory** (3) Krulfeld, Allen
Contemporary theories of culture. Intensive study of major works.

262 **Seminar: Applied Anthropology** (3) Lewis, Caro, Schumann
Use of anthropological methods and techniques in such specific fields as government, community development, land reform, law, and medicine. (Fall)

263 **Seminar: Culture Contact and Change** (3) Simons, Caro
Change in Western and non-Western cultures; emphasis on general processes of change and interaction between simpler and more complex societies. (Fall)

264 **Seminar: Anthropological Museum Techniques** (3) Humphrey
Principles of anthropological collection, classification, preservation, identification, interpretation, and exhibition of specimens; research and instructional use of the museum. Field trips to area museums. (Fall)

266 **Seminar: Technology** (3) Humphrey, Lewis
Cross-cultural examination of the form, function, meaning, and use of material culture and the behavior patterns involved in its production. (Spring, odd years)

267 **Seminar: Economic Anthropology** (3) Caro, Krulfeld
Comparative study of systems of production, distribution, consumption, political economy and economic change in both preliterate and complex societies.

268 **Seminar: Peasant Society** (3) Krulfeld
Cross-cultural analysis of peasant societies, including their manner of functioning within larger social, economic, and cultural contexts. (Fall)

269 **Seminar: Key Issues in Social Organization** (3) Simons
Current issues in the analysis and interpretation of kinship and political and legal phenomena, with particular emphasis on problems of social and ideological change in developing countries and their effect on sex roles, the family, and social networks. (Spring)

272 **Seminar: Topics in Latin American Anthropology** (3) Allen, Caro
Specific topics, to be announced, will be selected from the following: mythology and ritual, artistic traditions, ethnic groups, Andean or Tropical Forest social organization, peasant movements and land reform, native cultures during the Colonial period, archaeological problems.

273 **Seminar: Urban Anthropology** (3) Caro
A review of the literature on urban kin groups, occupational/class and ethnic communities, migrant adaptations; the nature of urbanism; urban poverty; urban field methods. (Spring)

274 **Seminar: Topics in American Culture** (3) Hertz
Review of anthropological literature on American world view, mainstream and alternate forms of kinship, selected ethnic groups, and the effects of sex, age, class, occupation, and politics on American life. (Fall)

282 **Seminar: Advanced Archaeology—New World Prehistory** (3) Humphrey
Current archaeological problems relating to the origin and development of aboriginal cultures. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit.

283 **Seminar: Topics in Old World Anthropology—Physical Anthropology and Archaeology** (3) Brooks
Current problems in relation to materials from the old world. Specific area to be announced in the *Schedule of Classes*. (Spring)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Same as IAff 287.

290 **Advanced Museum Research** (3) Staff
Supervised individual research and/or field work at the Smithsonian Institution or other area museums, arranged in consultation with the museum and the Anthropology Department. Admission by permission of the department chairman. May be repeated for credit. (Fall and spring)

291 **Anthropology in the Museum** (3) Evans, Humphrey
Anthropological materials (in the broadest sense), exhibits, and museums. Topics include museum anthropology, collections, research, interpretation, and education, with a focus on the practical problems of developing an anthropological exhibit hall. (Spring)

292 **Introduction to Conservation** (3) Rose
Joint offering of the Anthropology and Art Departments. Method and theory of conservation: including fine arts, ethnographic archaeological, and monuments conservation; handling, restoration, preservation, storage, and display of museum specimens; basic materials of museum objects and the ways they react to their environment. The summer course deals with conservation of archaeological materials. (Fall, spring, and summer)

293 **Preventive Conservation Techniques** (3) Rose
Joint offering of the Anthropology and Art Departments. Practical aspects of preventive conservation, such as monitoring environmental conditions with measuring and recording devices; examining objects and documenting their conditions (including photography); and identifying sources of deterioration for various materials. Students will conduct tests, evaluate exhibition and storage areas, and participate in improving and correcting museum conditions. Prerequisite: Anth/Art 292. (Spring)

294 **Field and Laboratory Research in Archaeology** (3) Cressey, Brooks
Joint offering of the Anthropology Department and the American Studies Program. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording, photography, preservation, stratigraphy and environmental reconstruction, typology, use–wear analysis, and spatial analysis. Specific research area and topics announced in the *Schedule of Classes*. May be repeated for credit. Same fieldwork as Anth 193 but with additional readings and research required. (Summer)

295 **Research** (arr.) Staff
May be repeated for credit. (Fall and spring)

298 **Dumbarton Oaks Courses** (arr.)
Courses offered each year by scholars in residence at Dumbarton Oaks are open to qualified graduate and undergraduate students with permission of department chairman. Topics will be announced. May be repeated for credit provided the topic differs. Staff

299–300 **Thesis Research** (3–3)
(Fall and spring)

## ART

Professors F.S. Grubar, D.H. Teller, L.F. Robinson *(Chair)*, J.F. Wright, Jr., A.H. Smith, J.L. Lake
*Professorial Lecturers* Grace Evans, L. Miller
*Associate Professors* H.I. Gates, T. Ozdogan, D.M. Hitchcock, J.C. Anderson, B. von Barghahn, S.B. Molina, W.T. Woodward, C.C. Costigan, M.P. Lader, J.L. Stephanic
*Adjunct Associate Professors* Grose Evans, A.D. Ullberg, C.R. Rose
*Associate Professorial Lecturers* D. Von Endt, D.C. Lynn, D. Srinivasan
*Assistant Professors* F. Griffith, K.J. Hartswick
*Assistant Professorial Lecturers* E.P. Lawson, K. Montgomery, A.B. Barnhart, C. Smigrod, B.G. Carson, C.R. Smith, M.J. Francis, J.F. Harrop, B.R. Stevens, R. Schanzer, R. Rodriguez, J. Paradiso, C.S. Rose, A.C. Palumbo, R. McCleary, M. Dennis
*Curator, Dimock Gallery* L.D. Miller

*Bachelor of Arts with a major in art history (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Art 31–32 and 71 or 72.
3. Required courses in related areas—Art 137; Fren 1–2–3, 4, or Ger 1–2, 3–4.
4. Required courses in the major—Art 101 and 102, 104 or 105, 106 or 107, 108, 109 or 110, 113 or 114, 117 or 118 or 119, 129; 9 additional semester hours in second-group art history courses.
5. A maximum of 9 semester hours in fine arts, including Art 137, is permitted.

*Bachelor of Arts with a major in fine arts (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. A total of 51 hours of art courses is required of fine arts majors except for students with a concentration in photography, for whom 54 hours are required.
3. Required basic fine arts courses: Art 21–22 and 41–42.
4. Required courses in art history: Art 31–32; 6 additional semester hours in second-group art history courses.
5. Required fine arts courses in the major:
   a. 12 hours, exclusive of primary area of concentration, in four of the following eight areas—ceramics, advanced drawing, advanced design, printmaking, painting, photography, sculpture, and visual communication.
   b. 15 hours to be taken in the primary area of concentration (except for photography and visual communication).
   c. 18 hours for students concentrating in photography: Art 23, 24, 181, 182, 205, 206.
6. Nine additional hours of electives may be taken in the Art Department, except for students concentrating in photography, who take only 6 hours of electives in the Art Department.
7. Transfer students must take at least 12 semester hours of second-group fine arts courses and 9 semester hours in their area of specialization at this University.

*Bachelor of Arts with a combined major in art history and fine arts*—The following requirements must be fulfilled in consultation with the departmental advisor:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. A total of 30 hours in art history and 30 hours in fine arts.
   a. Art history: Art 31–32, 71 or 72, and one course in each of the following areas—ancient, medieval, Renaissance, seventeenth and eighteenth centuries, nineteenth and twentieth centuries; 6 hours of art history electives.
   b. Fine arts: Art 21–22, 41–42. The remaining 18 hours may be in one area of concentration or a combination of areas.

**Special Honors**—For graduation with Special Honors, students must have attained a quality-point index of at least 3.5 in the major and 3.0 overall. No later than the beginning of the senior year, students should consult their advisor regarding eligibility and selection of an area of study and a director of the research or creative arts project.

*Bachelor of Arts/Master of Arts in the field of art therapy*—A five-year program leading to the B.A. in the field of fine arts or psychology and the M.A. in the field of art therapy. See Art Therapy.

*Bachelor of Arts with a major in classical archaeology and anthropology (departmental)*—An interdepartmental major offered by the Art and Anthropology Departments. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required courses in other areas: 6 semester hours, or equivalent, of introductory French, German, Latin, Greek, or a Near Eastern language. A second year of language study is strongly encouraged. Since graduate study in archaeology usually involves broader preparation, especially in languages, students intending to pursue graduate study should consult with the departmental advisor as early as possible.
3. Required courses in the major: Anth 3, 183–84, and one course chosen from Anth 152, 158, 177, or an approved 3-hour course in field work; four courses chosen from Art 101, 102, 103, 112, 155; two courses chosen from Clas 71, 72, 108, 113, 170; two courses chosen from Hist 107, 108, 109, 110 (students electing Hist 108 should previously have completed Hist 107 or 109).

*Bachelor of Arts with a major in classical archaeology and classics (departmental)*—An interdepartmental major offered by the Art and Classics Departments. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Clas 1–2, 3, 4; or Clas 11–12, 13–14.
3. Required courses in the major—Art 101, 102, 112, 155; three courses selected from Hist 107, 108, 109, 110, 209; 6 semester hours in second-group courses in Greek or Latin (a reading knowledge of French and German is recommended).

*Master of Arts in the field of art history*—Prerequisite: a Bachelor of Arts degree with a major in art history from this University, or an equivalent degree. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

1. *With a concentration in classical art and archaeology, medieval art, Renaissance and Baroque art, eighteenth- and nineteenth-century art, contemporary art, or American art*—Required: the general requirements stated under the Graduate School of Arts and Sciences; 30 semester hours of course work including 6 hours of thesis research. As much as possible of the 30 semester hours of course work should be in third-group courses, of which more than 6 hours may be taken in museum-related courses. Students are required to take a seminar in each of the following areas: classical, medieval, Renaissance, Baroque, modern, and American. Students must maintain a quality-point index of at least 3.0. A reading knowledge examination in German or French must be passed before completion of the first 9 semester hours of course work. A written general Master's Comprehensive Examination must be passed before students can enroll for the 6 semester hours of thesis research. A written thesis must be submitted to and approved by the faculty.

2. *With a concentration in museum training*—Required: the general requirements stated under the Graduate School of Arts and Sciences; 36 semester hours of course work as follows: 12 hours of art history courses, taken before acceptance into the museum program; Art 201–2 and 271–72; 6 additional hours of art history courses and 6 hours of electives selected in consultation with the advisor. Beyond the required courses, no more than 6 hours may be taken in museum-related courses. Students must maintain a quality-point index of at least 3.0. A reading knowledge examination in German or French must be passed before completion of the first 9 semester hours of course work. Students are required to pass the general written Master's Comprehensive Examination in art history and may also be required to pass a written comprehensive examination in museology as part of the requirements for the internship.

Acceptance into this program as a degree candidate is provisional, pending satisfactory completion of 12 semester hours of graduate art history courses and the approval of the Graduate Programs Committee (Department of Art).

The Art Department has established a program of study in affiliation with a number of museums and galleries including the Corcoran Gallery of Art, the Hirshhorn Museum

and Sculpture Garden, the Museum of African Art, the National Museum of American Art, the Phillips Collection, the Renwick Gallery, and the Textile Museum.

3. *With a concentration in museum administration*—For details consult the chairman of the department.

*Master of Fine Arts in the field of ceramics, design, printmaking, painting, photography, sculpture, or visual communication*—Prerequisite: a Bachelor of Fine Arts or a Bachelor of Arts degree with a major in fine arts in the field of ceramics, design, drawing, painting, photography, printmaking, sculpture, or visual communication. A 3.00 undergraduate grade point average (on a 4.00 scale) and departmental approval of the applicant's work is required. This should consist of slide examples of work in the area of application as well as slides of representative works in other areas. Students planning to do graduate work in printmaking or painting must have completed 12 semester hours of drawing at the undergraduate level before admittance to the master's program.

Required: the general requirements stated under the Graduate School of Arts and Sciences. As much as possible of the course work should be in third-group courses, only 18 hours of which may be in one area; 6–9 hours are to be selected from related areas in consultation with the advisor. A creative thesis consisting of the execution of original works of art in ceramics, design, drawing, painting, photography, printmaking, sculpture, or visual communication will be completed under the supervision of a thesis advisor. In addition, the thesis must include a written statement and analysis of artistic purpose, subject to the approval of the thesis advisor and a second faculty reader. A representative portion of the work illustrating the creative thesis may be retained by the University at the discretion of the thesis director in agreement with the second reader.

*Doctor of Philosophy in the field of art history*—Required: the general requirements stated under the Graduate School of Arts and Sciences, and a Master of Arts degree in art history. Candidates must also pass written examinations in French and German and General Examinations in one major area of specialization and two other areas of specialization. Language examinations should be completed within the first academic year of course work. Programs are planned in consultation with a departmental committee.

*Research fields*: Nineteenth- and twentieth-century European art and American art.

*Supporting fields*: Classical art and archaeology, early Christian and Byzantine art, Northern Renaissance art, and Baroque art.

## ART HISTORY

### First Group

1 **Principles of Art** (3) von Barghahn
An introduction to various art media, basic elements of art and thematic interpretations. European and non-Western traditions. (Fall and spring)

31–32 **Survey of Western Art** (3–3) Robinson and Staff
A foundation for further study in the history of art. Art 31: prehistoric to Gothic art. Art 32: proto-Renaissance to modern art. (Art 31 and 32—fall and spring)

71–72 **Introduction to the Arts in America** (3–3) Grubar and Staff
Art 71: Colonial beginnings to the Republican Age. Art 72: 19th century to the present. (Art 71 and 72—fall and spring)

### Second Group

101 **Greek Art and Archaeology** (3) Hartswick
A survey of Greek sculpture, painting, and architecture, from the Dark Ages (ca. 1000 B.C.) through Alexander the Great (ca. 300 B.C.). Emphasis is on the stylistic development of Greek art and the interrelationships among sculptural technique and style, major changes in vase painting, and the refinements of architectural elements. (Fall)

102 **Roman Art and Archaeology** (3) Hartswick
A survey of Roman sculpture, painting, and architecture, from 300 B.C. (the Etruscans) to the end of the Constantinian Period (ca. 300 A.D.). The major artistic achievements of the Romans—portraiture, historical narratives—and the stylistic changes from the idealized and illusionistic to the realistic and abstract. (Spring)

103 **The Ancient Artist and His Workshop** (3) Hartswick
A study of the ancient craftsman's techniques, workshop organization, and position in society. Exploration of sculpture, architecture, painting, pottery, mosaics, gems, glass, and metalwork.

104 **Renaissance Art in Italy I** (3) Grace Evans
Early developments from the 13th to the 15th century. (Fall)

105 **Renaissance Art in Italy II** (3) Grace Evans
High Renaissance and Mannerism. (Spring)

106 **Renaissance Art in the North I** (3) Hitchcock
Northern painting from van Eyck through Bosch. (Fall)

107 **Renaissance Art in the North II** (3) Hitchcock
Northern painting and graphics from Dürer through Brueghel. (Spring)

108 **18th-Century Art in Europe** (3) Hitchcock
Painting, sculpture, and architecture in France, Great Britain, and Italy. Emphasis on Watteau, Chardin, David, Hogarth, Gainsborough, Reynolds, Canaletto, and Tiepolo. (Spring)

109 **19th-Century Art in Europe I** (3) Robinson
Examination of Neoclassicism and Romanticism in the context of Western European historical and cultural developments. Emphasis on France, England, and Germany and the representative styles of David, Ingres, Delacroix, Turner, Constable, and Friedrich. (Fall)

110 **19th-Century Art in Europe II** (3) Robinson
Examination of the revolution in style of Realism, Impressionism, and Post-impressionism in the context of Western European political, social, and cultural developments. Emphasis on representative styles of Courbet, Manet, Monet, Cezanne, Van Gogh, and Gauguin. (Spring)

111 **Classical Archaeology** (3) Hartswick
Archaeological monuments of classical civilizations, with intensive study of one or more areas selected from architecture, sculpture, painting, or minor arts.

112 **Egypt and the Near East** (3) Hartswick
The great artistic tradition of the Nile Valley and the contemporary civilizations (ca. 3000 B.C. to after 1000 B.C.) between the rivers Tigris and Euphrates (present day Iraq) are explored. Emphasis on the Pyramid Age, the temples at Karnak and Luxor, the tombs of the Valley of the Kings, and the artistic traditions of the Sumerians, Akkadians, Babylonians, Assyrians, and Persians. (Fall)

113 **Baroque Art in Italy** (3) Grace Evans
(Spring)

114 **Baroque Art in the North** (3) Hitchcock
Concentration on France, Flanders, and Holland, with emphasis on Poussin, Rubens, Van Dyck, and Rembrandt. (Fall)

115 **Christian Iconography** (3) Grace Evans
Origins and development of Christian symbols and themes from early Christian to the Council of Trent.

116 **Islamic Art** (3) Staff

117 **Medieval Art I** (3) Anderson
Early Christian and Byzantine. (Fall)

118 **Medieval Art II** (3) Anderson
Romanesque and Gothic. (Spring)

119 **Islamic Religion and Art** (3) Nas
Same as Rel 163.

120 **East Asian Art** (3) Srinivasan
May be repeated for credit when content differs.

121 **Spanish Art I** (3) von Barghahn
Discussion of areas selected from the art of ancient Iberia through the seventeenth century. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the content differs.

122 **Spanish Art II** (3) von Barghahn
Discussion of areas selected from the eighteenth through twentieth centuries. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the content differs.

129 **20th-Century Art in Europe** (3) Lader
Survey of 20th-century European painting, sculpture, and architecture, from their origins in the late 19th century through Surrealism. Emphasis on major modernist movements and artists, including Matisse, Picasso, Kandinsky, and Mondrian. (Fall)

130 **20th-Century American Art** (3) Lader
Survey of 20th-century American painting and sculpture, focusing upon the avant-garde. Emphasis on artists of the Stieglitz circle and later modernist movements such as Abstract Expressionism, Pop, Op, Minimal, and Conceptual art. (Spring)

140 **Gothic Architecture** (3) Staff

145 **Folk Arts in America** (3) Grubar
Ceramics, woodcarving, ironwork, decorative painting, weaving, and other crafts.

147 **Primitive Art I: Ancient Civilizations of Mexico and Latin America** (3) von Barghahn
Survey of Pre-Columbian art and architecture from prehistoric period to the Spanish conquest, including Yucatan and Central American regions.

148–49 **19th-Century American Painting and Sculpture** (3–3) Grubar
Fall: 1800–1860; spring: 1860–1900. (Academic year)

150 **Landmarks in American Art** (3) Grubar

155 **Aegean Civilizations** (3) Hartwick
An introduction to the excavational and multidisciplinary aspects of classical archaeology. Minoan and Mycenaean civilizations (1700–1200 B.C.). Interrelationships between Greek and Persian cultures of the sixth and fifth centuries B.C. (Spring)

156 **Early Medieval Sculpture** (3) Grace Evans

161 **Studies in Renaissance Art** (3) Grace Evans

162 **Principles of Museum Work** (3) Lawson
Introduction to the history and development of museums: problems of museum administration, connoisseurship, cataloguing, installation, conservation, and educational service.

165 **Primitive Art II: African, Oceanic, North American Indian** (3) von Barghahn
Survey of architecture, sculpture, and painting from ancient kingdoms to early 20th-century culture. Emphasis on imagery and iconography.

167 **The Dynastic Courts of Europe** (3) von Barghahn
Politics and royal patronage, 1400–1800. Areas may include France, Italy, Spain, Portugal, Austria, Germany, or Russia. Specific area announced in *Schedule of Classes*. May be repeated for credit if specific area is different.

169 **History of Decorative Arts: European Heritage** (3) Carson
Survey of changing styles of European furniture, textiles, ceramics, and glass, in the context of general trends in art history and changing patterns in economic, technological, social, and cultural history. From antiquity to the modern age. (Fall)

170 **History of Decorative Arts: American Heritage** (3) Carson
Examination of the decorative arts in America from the 17th century to the modern period. Exploration of changing visual characteristics in relation to the changing American experience. (Spring)

173 **History of the Cinema** (3) — Staff
Same as Comm 173. Laboratory fee, $25.

176 **American Architecture** (3) — Longstreth
Same as AmCv/U&RP 175.

187 **Individualism, Reason, and Tradition in Early Modern Europe** (3) — Kennedy
Same as Engl/Fren/Ger/Hist/Rel 183.

191 **American Architecture** (3) — Longstreth
Same as AmCv/U&RP 176.

192 **The American Cinema** (3) — Staff
Same as AmCv 192.

197 **History of Photography: The 19th Century** (3) — Lader

198 **History of Photography: The 20th Century** (3)

**Third Group**

201–2 **Museum Projects** (3–3) — Staff
Open only to candidates for the degree of Master of Arts in the field of art history with a concentration in museum training.

203 **Primitive Art** (3) — von Barghahn
(Spring)

207 **Modern Architecture** (3) — Lader
Europe and America.

211 **Seminar: Problems in Conservation** (3) — Rose
Joint offering of the Art and Anthropology Departments. Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite or concurrent registration: Art or Anth 212. (Fall) — Von Endt

212 **Advanced Conservation Techniques** (3)
Joint offering of the Art and Anthropology Departments. Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying the techniques used to conserve these materials. Prerequisite: Art or Anth 293, Chem 50, and permission of the instructor. (Fall) — Grace Evans

216 **Medieval Painting** (3) — Ullberg
Painting and the decorative arts.

217–18 **Problems in Museum Work** (3–3) — Hitchcock
Art 217 is prerequisite to Art 218.

*220 **Seminar: Baroque Art of the 17th Century** (3) — Staff
A reading knowledge of Italian is desirable for the Italian area and German for the northern area. (Spring)

*221 **Seminar: Renaissance Art** (3) — Gruber
A reading knowledge of French, German, or Italian is desirable, depending on the specific area. (Fall and spring)

*†243 **Seminar: American Art** (3) — Robinson
(Fall and spring)

*†244 **Seminar: 19th-Century European Art** (3) — Lader
Reading knowledge of French desirable.

*†245 **Seminar: 20th-Century European Art** (3) — Hartwell, Anderson

*246 **Seminar: Classical Art** (3)

*247 **Proseminar: Medieval Art and Archaeology** (3)

248 **Independent Research in Art History** (3) — Staff
(Fall and spring)

*261 **Seminar: Problems in Art History** (3)

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* Specific area announced in the *Schedule of Classes*. May be repeated for credit if the specific area covered is different.
† Laboratory fee, $15 when course is taught off campus.

271–72 **Museum Techniques** (3–3)
Staff
Open only to candidates for the degree of Master of Arts in the fields of museum training and museum studies. Practical work to be determined by Museum Training Committees at the institutions involved. (Academic year)

284 **Seminar: Studies in American Art and History** (3)
Staff
Joint offering of the Art Department and the American Studies Program in affiliation with the National Portrait Gallery of the Smithsonian Institution. Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. (Spring)

289–90 **Thesis Research** (3–3)
Staff
(Fall and spring)

292 **Introduction to Conservation** (3)
Rose
Interdepartmental course offered by the Art and Anthropology Departments. Method and theory of conservation, including fine arts, ethnographic, archaeological, and monuments conservation; handling, restoration, preservation, storage, and display of museum specimens; basic materials of ethnographic objects and the ways they react to their environment. The fall section is open to conservation students and to those who plan to register for Art 293 in the spring. (Fall and spring)

293 **Preventive Conservation Techniques** (3)
Rose
Interdepartmental course offered by the Art and Anthropology Departments. Practical aspects of preventive conservation, such as monitoring environmental conditions with measuring and recording devices, examining objects and documenting their conditions (including photography), and identifying sources of deterioration for various materials. Students will conduct tests, evaluate exhibition and storage areas, and participate in improving and correcting museum conditions. Prerequisite: Anth/Art 292.

**Fourth Group**
Limited to art history doctoral candidates. Offered as the demand requires. May be repeated for credit.

385–86 **Readings in Art History** (3–3)

398 **Advanced Reading and Research** (arr.)
For students preparing for the doctoral examination.

399 **Dissertation Research** (arr.)

## FINE ARTS

**First Group**

21–22 **Design I: Basic** (3–3)
Costigan, Teller
Required of all Fine Arts majors. Fundamental studies of principles and elements of design. Art 21: study of two-dimensional design. Art 22: three-dimensional studies. Art 21: Laboratory fee, $15. Art 22: Laboratory fee, $21. (Art 21 and 22—fall and spring)

23 **Photography I: Introduction** (3)
Lake and Staff
Introduction to the principles of exposure and development of films and papers. Emphasis on creative expression. Laboratory fee, $54. (Fall and spring)

24 **Photography II** (3)
Stephanic
Continuation of Art 23. Experimentation with black and white films and developers. Improvement of printing and exposure techniques. Emphasis on control for creative expression. Prerequisite: Art 23. Laboratory fee, $54. (Fall and spring)

41–42 **Drawing I** (3–3)
Wright and Staff
Elementary investigation of concepts of drawing, both traditional and contemporary; training in perception, analysis of form in light and space;

instruction in the use of graphic materials and media; exercises in connoisseurship. Material and model fee, $45 per semester. (Art 41 and 42—fall and spring)

51 **Introduction to Handbuilt Ceramics** (3) Ozdogan and Staff
Working with clay as an art form. Exploration of pinch, coil, slab, hump and press mold, paddling, and hollowing techniques. Sketch studies, reduction and oxidation kiln firings, clay and glaze making. Laboratory fee, $57, including unlimited materials and use of tools. (Fall and spring)

52 **Introduction to Wheelthrown Ceramics** (3) Ozdogan and Staff
Development of cylindrical and open forms. Trimming, clay and glaze making, reduction and oxidation kiln firings. Sketch studies. Laboratory fee, $57, including unlimited materials and use of tools. (Fall and spring)

57 **Printmaking: Introduction to Relief and Planographic Techniques** (3) Griffith
Exploration in monochrome and color of basic methods of these techniques, i.e., woodcut, composite relief, monotype, and lithography. Emphasis on aesthetic qualities of prints. Laboratory fee, $36. (Fall)

58 **Printmaking: Introduction to Intaglio and Stencil Techniques** (3) Griffith
Exploration in monochrome and color of basic methods of these techniques, i.e., etching, engraving, collograph, stencil, and composite intaglio. Laboratory fee, $36. (Spring)

61–62 **Water Color** (3–3) Staff
Painting in transparent and opaque water color and in acrylic. Experimentation, figurative, and landscape. Laboratory fee, $15 per semester. (Academic year)

65–66 **Painting I** (3–3) A. Smith and Staff
Emphasis on personal expression with exposure to a variety of styles. Application of design principles to easel painting. Material and model fee, $39 per semester. (Academic year)

81–82 **Sculpture I** (3–3) Gates and Staff
Beginning study of design and fabrication of sculpture. Basic sculptural techniques for media, including clay, plaster, stone, and wood. Laboratory fee, $24 per semester. (Academic year)

**Second Group**

Second-group art courses may be repeated for credit with approval of the department

123–24 **Individual Problems** (3–3) Staff
Emphasis on problems and materials of specific interest to the student in any area of Fine Arts. Laboratory fee depending on area chosen.* Prerequisite: permission of instructor. (Academic year)

125–26 **Painting II** (3–3) A. Smith
Alteration of personal expression and structured problems dealing with still life and the figure. Use of acrylic and oil. Material and model fee, $39 per semester. (Academic year)

127–28 **Painting III** (3–3) Woodward
Studies in the interpretation of the figure and still life. Emphasis on color, space, planes, modulations. Alla prima and mixed techniques. Material and model fee, $39 per semester. (Academic year)

131 **Intermediate Ceramics: Wheelthrown Functional Forms** (3) Ozdogan and Staff
Aesthetic and technical development of wheelthrown functional ceramic forms. Exploration of attachments: lids, spouts, handles, and footing devices

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* *Schedule of Fees*: Ceramics—$57; 2-D Design—none; 3-D Design—$24; Drawing—$39; Printmaking—$36; Sculpture—$24; Typography—$54; Painting—none; Photography—$54; Visual Communication—$54; Lithography—$36; Serigraphy—$21.

Sketches and technical drawings, clay and glaze-making tests, varied temperature firings in reduction and oxidation atmospheres. Laboratory fee, $57. (Fall and spring)

132 **Intermediate Ceramics: Wheelthrown Nonfunctional Forms** (3) Ozdogan and Staff
Aesthetic and technical development of wheelthrown ceramic sculptural forms. Emphasis on section throwing, closed forms, and construction. Varied temperature firings in oxidation and reduction atmospheres. Clay and glaze making. Laboratory fee, $57. (Fall and spring)

133 **Ceramic Decoration** (3) Ozdogan
Aesthetic and technical development of surface decoration, with experimental projects in sgraffito, mishima, engobe, majolica, underglaze, overglaze, and relief techniques. Laboratory fee, $57. (Fall)

134 **Nonsilver Printing Processes in Photography** (3) Smigrod
Introduction to nonsilver and archaic photographic processes. At least three processes will be explored. Emphasis on creative expression. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $57. (Spring)

135–36 **Advanced Water Color** (3–3)
Development of techniques of water color; concentration on special projects. Laboratory fee, $15 per semester. (Academic year)

137 **Workshop in Materials, Methods, and Techniques** (3) Woodward, A. Smith, and Staff
Technical investigation of painting methods from the 14th century to the present. Preparation of grounds, media, underpainting, glazing. Laboratory fee, $15. (Fall and spring)

138 **Printmaking: History and Practice** (3) Griffith
Lecture survey through slides and original prints of the history of the fine art etching, engraving, woodcut, stencil, and lithograph. Laboratory demonstrations with student participation. This basic course is designed for artists, art historians, art dealers, appraisers, librarians, commercial artists, and collectors. There is no prerequisite. Laboratory fee, $24. (Summer)

139 **Design in Fiber** (3) Costigan
Emphasis on individual expression in two- and three-dimensional fiber works, with exposure to a variety of styles, attitudes, and materials. Laboratory fee, $9.

141 **Interior Design** (3) Teller
Survey of basic interior design materials and techniques. Topics include floor plans and design, interior renderings, hard and soft materials, furniture styles. Laboratory fee, $21. (Fall)

142 **Interior Design Problems** (3) Teller and Staff
A theoretical and practical in-depth exploration of a specific area of interior design selected from furniture design, construction and restoration, history of furnishings, and interior rendering. Topic to be announced in the *Schedule of Classes*. Prerequisite: Art 141 or equivalent. Laboratory fee, $21. (Spring)

143–44 **Serigraphy** (3–3) Teller
Fine Arts printmaking using serigraphic techniques. Utilization of all basic techniques; emphasis on aesthetic properties of prints. Laboratory fee, $21 per semester. (Academic year)

146 **Ceramic Restoration** (3) Ozdogan
Methods and techniques for museum and commercial application. Laboratory fee, $57. (Summer)

151 **Ceramic History and Technology** (3) Ozdogan and Staff
A survey of the history of ceramics and its technology. Lectures, demonstrations, and supplemental programs. Laboratory fee, $21. (Fall)

152 **Ceramic Sculpture** (3) Ozdogan
Developing an understanding of the sculptural ceramic form that integrates both quality and creativity. Techniques in hollow and solid construction. Varied temperature firings in reduction and oxidation atmospheres. Laboratory fee, $57. (Fall)

153 **Printmaking: Intermediate Study of Intaglio and Relief Techniques** (3) Griffith
Investigation in monochrome and color of these techniques, i.e., etching, engraving, woodcut, wood engraving, stencil, composite processes, and mixed media. Prerequisite: Art 57, 58. Laboratory fee, $36. (Fall)

154 **Printmaking: Introduction to Light-Sensitive Grounds** (3) Griffith
Exploration of the use of grounds on copper that are sensitive to light for the purpose of etching. Printing in monochrome and color. Prerequisite: Art 153 or equivalent. Laboratory fee, $36. (Spring)

157–58 **Printmaking: Advanced Study of Intaglio and Relief Techniques** (3–3) Griffith
Intensive exploration in monochrome and color of printmaking: etching, engraving, woodcut, wood engraving, stencil, collograph printing with light-sensitive grounds, composite techniques, and mixed media. Emphasis on utilization of techniques in developing a personal statement and style. Prerequisite: Art 153, 154, or equivalent. Laboratory fee, $36. (Fall and spring)

159–60 **Drawing II** (3–3) Wright and Staff
Study and application of master drawing techniques. Investigation of perspective and anatomy. Emphasis upon conceptual development of personal style. Material and model fee, $45 per semester. (Academic year)

163 **Visual Communication I: Basic Layout** (3) Molina and Staff
Layout stages, including basic formats, production processes; working with type and basic skills. Prerequisite: Art 171. Laboratory fee, $54.

164 **Visual Communication II: Problem Solving** (3) Molina and Staff
Conceptual approach to problem solving. Various graphic design problems, including both small-format and large-format design in commercial and institutional graphics. Prerequisite: Art 163, 172. Laboratory fee, $54.

166 **Advanced Drawing Techniques** (3) A. Smith and Staff
Specific area announced in the *Schedule of Classes*. May be repeated for credit if the area covered is different. Laboratory fee, $36.

168 **Intermediate Ceramic Design in Handbuilding** (3) Ozdogan
Further concentration in handbuilding techniques of pinch, coil, slab, hump and press mold, paddling, and hollowing. Sketch studies, clay and glaze tests. Orientation to studio operations and maintenance. Laboratory fee, $57. (Fall and spring)

171 **Typography I** (3) Molina and Staff
Basic calligraphy for traditional and contemporary use. Type theory, including specification, copy fitting, and study of letter form as used in graphic design. Laboratory fee, $54.

172 **Typography II** (3) Molina and Staff
Study of type classification, recognition, and adaptation. Methods of type specification, copy fitting, and typesetting processes. Typographic layout and alphabet design. Prerequisite: Art 171. Laboratory fee, $54.

174 **Visual Communication III: Computer Graphics Seminar** (3) Molina and Staff
Introduction to computer graphics for art majors. The use of computers in the design process and as a tool for problem solving in graphic design. Laboratory fee, $54.

175 **Printmaking: Introduction to Lithography** (3) Bernhart
Study of techniques and materials related to printing images from stones and metal litho plates. Prints in crayon, tonal washes, and multicolor. Laboratory fee, $36.

177–78 **Survey of Printing and Illustration** (3–3) Staff
Exposure to a maximum range of illustrative processes, both practical and theoretical. Technical aspects of commercial printing processes; methods of preparation of artwork, photographs, and typographic proofs for commercial reproduction. (Academic year)

179–80 **Sculpture II** (3–3) Gates
Expansion of Sculpture I, utilizing advanced wood milling equipment and metal welding techniques. Prerequisite: Art 81–82. Laboratory fee, $24.

181 **Introduction to Color Photography** (3) Lake
Introduction to color through exposure and processing of color transparency films. Use of filters for creating and correcting color shifts, with emphasis on color as subject matter. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $54. (Fall)

182 **Introduction to Photographic Lighting** (3) Stephanic
Introduction to various lighting techniques. Available light manipulation, studio lighting, and copy lighting will be explored. Emphasis on creative expression. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $54. (Fall and spring)

183 **Experimental Photography** (3) Staff
Structured exploration of various photographic processes and techniques. Emphasis on creative expression. Content of course will vary; contact department for current offering. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $54. (Fall and spring)

184 **Jewelry Design and Techniques** (3) Gates
Laboratory fee, $24. (Summer)

185–86 **Portrait Painting and Drawing** (3–3) C. Smith
Fall: Various media; drawing and pastel. Spring: Oil. Model fee, $45 per semester.

189–90 **Sculpture III** (3–3) Gates
Advanced study in concepts and materials through creation of three-dimensional forms concentrating on relevance of scale and media. Relationship of sculpture to the environment. Prerequisite: Art 179–80. Laboratory fee, $24 per semester. (Academic year)

193 **Film Making I** (3) Staff
Introduction to the basic techniques and procedures for film making. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $54. (Fall and spring)

194 **Film Making II** (3) Staff
Continuation of Art 193 with more advanced projects. Prerequisite: Art 193 or permission of instructor. Laboratory fee, $54. (Fall and spring)

195 **Documentary Photography** (3) Staff
Historical development of documentary photography. Completion of two projects required. Laboratory fee, $54. Prerequisite: Art 23 and 24 or permission of instructor. Same as Jour 195. (Fall)

**Third Group**

All third-group art courses may be repeated for credit with the approval of the department.

205 **Advanced Photography: Zone System Tests** (3) Lake
Tone control through exposure development tests. Completion of laboratory manual required. Prerequisite: Art 181 and 182 or permission of instructor. Laboratory fee, $54. (Fall and spring)

206 **Advanced Photography: Color Printing and Zone Proofs** (3) Lake
Printing from color negatives. Correct color balancing and creative color shifts will be explored. Development of portfolio of prints utilizing approved theme and the exposure and development times established in Art 205. Prerequisite: Art 181 or 205, as determined by instructor. Laboratory fee, $54. (Fall and spring)

208 **Advanced Photography: Special Projects** (3) Lake and Stephanic
Independent projects requiring approval prior to registration. Prerequisite: Art 181 and 182, or permission of instructor. Laboratory fee, $54. (Fall and spring)

209–10 **Exhibition and Display Design** (3–3) Miller
224 **Advanced Ceramic Sculpture** (3) Ozdogan
Continuation of Art 152 with emphasis on individual approach. Exploration of mixed media and mold casting. Laboratory fee, $57. (Fall)
225 **Advanced Ceramic Decoration** (3) Ozdogan, Smith
Perfection of decorating techniques. Students establish style through independent exploration. Laboratory fee, $57. (Spring)
226 **Architectural Ceramics** (3) Ozdogan
Advanced studies in ceramic murals and sculptures designed for indoor and outdoor architectural concepts. Laboratory tests and activities. Laboratory fee, $57. (Spring)
231–32 **Design III** (3–3) Gates
New media and techniques in three-dimensional design. Laboratory fee, $24 per semester. (Academic year)
234 **Design IV: Jewelry Design** (3) Gates
Theory and fabrication of jewelry using basic metal techniques, assemblage approach, and lost-wax casting. Laboratory fee, $30. (Fall and spring)
235 **Design V: Textile Printing** (3) Teller
Designing and executing textiles using the techniques of silk screen, block print, and batik. Laboratory fee, $21. (Fall and spring)
248 **Independent Research in Fine Arts** (3)
For master's degree candidates; open to limited number of qualified undergraduates, with permission. Independent research arranged in consultation with individual instructor and graduate advisor. May be repeated for credit. Laboratory fee depending on area chosen.* (Fall and spring)
249 **Theory of Design** (3) Costigan
Application of design principles to problems of the artist in all disciplines. Emphasis on individual creativity, presentation, and criticism. Guest lectures on issues in contemporary art. Open to all M.F.A. candidates and to seniors with permission of instructor. Laboratory fee, $9.
251 **Advanced Ceramic Design in Wheel Throwing** (3) Ozdogan
Individual projects on the potter's wheel. Student establishes personal style and direction and perfects skills. Either pottery or sculptural approaches encouraged. Research in clays, glazes, and firings is required. Laboratory fee, $57. (Fall and spring)
252 **Advanced Ceramic Design in Hand Building** (3) Ozdogan
Individual projects in hand building. Student establishes style and direction and perfects skills. Either pottery or sculptural approaches encouraged. Research in clays and glazes is required. Laboratory fee, $57. (Fall and spring)
253 **Industrial Ceramic Design/Mold Making** (3) Ozdogan
Study in the multiple production process from model making to finished duplicate form as it exists on factory level. Methods include all aspects of model designing and making in clay and plaster; mold making in plaster; production methods from molds including press molding, slip casting, jiggering, and jollying. Laboratory fee, $57. (Fall and spring)
254 **Ceramic Glazes: Calculation and Formulation** (3) Staff
Laboratory fee, $21. Teller
255–56 **Printmaking: Advanced Serigraphy** (3–3)
Utilization of principles and techniques of serigraphy toward development of personal statement and style. Prerequisite: Art 143–44. Laboratory fee, $21 per semester. (Academic year) Griffith
257–58 **Printmaking: Etching and Engraving** (3–3)
Advanced problems in etching and engraving, including composite process

* *Schedule of Fees:* Ceramics—$57; 2-D Design—none; 3-D Design—$24; Drawing—$45; Printmaking—$36; Sculpture—$24; Typography—$54; Painting—none; Photography—$54; Visual Communication—$54; Serigraphy—$21; Lithography—$36.

es, light-sensitive grounds, mixed media, and theoretical and practical problems of color prints. Laboratory fee, $36. (Fall and spring)

259 **Printmaking: Advanced Lithography** (3) Barnhart
Individual problems in lithography related to printing images from stones and metal litho plates. Prints in crayon, tonal washes, and multicolor. Emphasis on mastering the lithographic process and developing a personal statement and style. Laboratory fee, $36.

260 **Printmaking: Relief Printing** (3) Griffith
Advanced problems, practical and theoretical, in woodcut, wood engraving, collograph, composite techniques, and mixed media in monochrome and color. Laboratory fee, $36. (Fall and spring)

265–66 **Painting IV** (3–3) Woodward
Alternatives in pictorial dynamics. Assigned studio and independent problems in alla prima and mixed techniques. Material and model fee, $39 per semester. (Academic year)

267–68 **Individual Problems in Photography** (3–3) Stephanic
Limited to M.F.A. candidates and qualified undergraduates. Prerequisite: Permission of instructor and approval of project prior to registration. May be repeated for credit. Laboratory fee, $54 per semester. (Academic year)

275 **Painting V** (3) Woodward
Development of personal imagery. Individual problems and critiques. Material and model fee, $39.

277 **Advanced Visual Communication: Packaging Design and Illustration** (3) Molina
Advanced studio projects. May be repeated for credit provided the content differs. Laboratory fee, $36. (Fall and spring)

278 **Advanced Visual Communication: Problem Solving and Applied Design** (3) Molina
Advanced studio projects. May be repeated for credit provided the content differs. Laboratory fee, $36. (Fall and spring)

279–80 **Sculpture IV** (3–3) Gates
Advanced study aimed at development of concept and style. Prerequisite: permission of instructor. Laboratory fee, $24. (Academic year)

281 **Sculpture V** (3) Gates
Emphasis on individual sculptural concepts and materials. Prerequisite: permission of instructor. Laboratory fee, $24. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
Laboratory fee depending on area chosen.* (Fall and spring)

## ART THERAPY—GRADUATE PROGRAM

Professor D.E. Silber
Adjunct Professor E. Ulman
Adjunct Associate Professor E. Kramer
Assistant Professor K.J. Williams *(Program Director)*
Adjunct Assistant Professors W. Maiorana, P.A. Ravenscroft, A.J. DiMaria, B. Sobol
Clinical Instructors D.K. Conger, B.K. Mandel, N.J. Schoebel, N.J. Miller, J.C. Ramsay, E.S. Kramer, M.M. Eife, S. Geller, J.P. Torrenzano, T. Tripp
Lecturers A. Corson, P. Howie

*Master of Arts in the field of art therapy*—Prerequisite: a bachelor's degree, evidence of significant training and/or experience in art, including painting, drawing, and clay modeling; course work in the behavioral and/or social sciences, including personality theory, abnormal psychology, and child psychology.

* Schedule of Fees: Ceramics—$57; 2-D Design—none, 3-D Design—$24, Drawing—$45; Printmaking—$36, Sculpture—$24, Typography—$54, Painting—none, Photography—$54; Visual Communication—$54, Serigraphy—$21; Lithography—$36.

Required: the general requirements stated under the Graduate School of Arts and Sciences and successful completion of 36 credit hours of graduate course work. At least 21 credit hours must be in art therapy and must include ArTh 201, 203, 205–6 or 207 and 208, 224, 226, and 283–84.

*Fields of emphasis*: adult art therapy, family art therapy, child art therapy, and research.

*Bachelor of Arts/Master of Arts in the field of art therapy*—A five-year program leading to the B.A. in the field of fine arts or psychology and the M.A. in the field of art therapy. The first three years of the program consist of undergraduate course work. Application for admission to the M.A. program in art therapy will be made to the Graduate School of Arts and Sciences during the second semester of the third year; for admission to the graduate portion of the program, acceptance must be obtained prior to the start of the fourth year of the program. If acceptance to the M.A. program in art therapy is not desired or not obtained, the requirements for the B.A. degree in the undergraduate field chosen may be fulfilled by the successful completion of appropriate courses during the fourth year of study. If acceptance into the M.A. program in art therapy is obtained, the B.A. will be awarded after the successful completion of the fourth year of the program. Study during the summer following the award of the bachelor's degree and the following academic year would normally complete the M.A. degree requirements.

The following requirements must be fulfilled:

1. Students must meet the general requirements stated under Columbian College of Arts and Sciences and the Graduate School of Arts and Sciences.
2. The course requirements for the B.A. in either fine arts or psychology and for the M.A. in art therapy must be met.

201 **Introduction to Art Therapy** (3) Staff
Lectures, presentation of illustrative case material, class discussion of assigned readings, field work. Survey covering range of art therapy practice, personality assessment and treatment approaches, historical development, main theoretical trends. Open only to art therapy degree candidates. (Fall)

202 **Case Studies in Art Therapy** (3) Staff
Discussion of case material provided by students in order to refine methods of working and to improve written and oral reports. Instructor and other practitioners may provide supplementary illustrative material. Assigned reading. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Spring)

203 **Technique of Art Therapy** (3) Williams
Art therapy approaches with individuals and groups of different diagnostic categories in various settings presented through illustrative clinical examples. Students experiment with numerous techniques through the use of art materials. Open only to art therapy degree candidates. (Fall)

204 **Psychodynamic Processes in Art Therapy** (3) Kramer, Ulman
Concepts of instinctual drives; ego development; mechanisms of defense; sublimation; transference and countertransference; maturation and regression applied to work with children, adults, families, and groups. (Spring)

205–6 **Family Art Techniques** (3–3) Howie, Ravenscroft
Principles of work with families, with emphasis on the use of art techniques for evaluation of family dynamics. The major focus is on opportunities to conduct and observe family art evaluations. Enrollment is limited to 12. Prerequisite: ArTh 201, 203. Open to art therapy degree candidates only. (Fall and spring)

207 **Art as Therapy with Children** (3) Majorana
Introduction to the practical and theoretical considerations involved in art as therapy with children. Focus on psychodynamics, artistic developmental stages, methods of child art evaluation, and basic issues in therapeutic guidance of the child. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Fall)

208 **Art Therapy with Adolescents** (3) Corson
Theoretical and practical issues in art therapy with adolescents in educational and clinical settings. Experiential work in art techniques appropriate to this population. Class discussion of readings on adolescent development. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Spring)

211 **Survey of Art Therapy** (3) DiMaria
Use of visual arts to enhance personal development; history, theories, range of practice in art therapy. Illustrated lectures, reading, discussion, studio work. Not intended for art therapy degree candidates. Open to advanced undergraduates with permission of instructor. (Fall)

224 **Process of Art Therapy** (3) Maiorana, Williams
Exploration of the treatment process through discussion of literature from art therapy and related fields. Several critical papers will be required. Must be taken concurrently with ArTh 226. (Spring)

226 **Process of Art Therapy** (3) Maiorana, Williams
Exploration of the treatment process through rehearsal of fundamental ways of being a therapist and presentation of case material from field experience. Video- and audiotaping required. Must be taken concurrently with ArTh 224. (Spring)

275 **Group Art Therapy** (3) Williams
Experience as participant, observer, and leader in an art-centered group; required reading; theory of group process. Open to art therapy master's degree candidates and others with permission of instructor. (Summer)

283–84 **Practicum in Art Therapy** (3–3) Staff
Minimum of 300 hours field work per semester connected with service to clients. On-the-job supervision supplemented by group supervision from the art therapy staff. Prerequisite: ArTh 201 and 203. Open only to art therapy degree candidates.

285 **Special Projects in Art Therapy** (arr.) Staff
Individual work based on research. Empirical, clinical, and library research may be undertaken, as well as the development of new procedures. Details to be worked out with each student. May be repeated for credit with advisor's approval. Open only to degree candidates. (Fall and spring)

289 **Special Topics in Art Therapy** (1 to 3) Staff
Connections between art therapy and other disciplines; new developments in the field. May be repeated for credit with approval of advisor. Open to art therapy degree candidates and others with permission of instructor.

290 **Workshops in Art Therapy** (3) Staff
Art therapists and other mental health professionals will conduct four weekend workshops during the semester. Emphasis on the elucidation of concepts of treatment through lectures, discussion, and participation. (Fall)

298 **Reading and Research** (1 to 3) Staff

## ASSOCIATION MANAGEMENT—GRADUATE PROGRAM

See the School of Government and Business Administration for the program of study leading to the degree of Master of Association Management.

270 **The Association: Roles, Influence** (3) Keane
Introduction to the Association Management Program; development and nature of interest representation, its history; varieties of associations and their roles and functions, legal constraints, responsibilities, and ethics. (Fall and spring)

271 **Marketing Management for Associations** (3) Staff
Market analysis, product planning, channels of distribution, pricing, and promotional decision making are presented, with particular application to associations. Topics include membership recruitment; fees, dues, and other

monetary issues; physical location of the association; staff–membership contacts; promotion of association goals. (Fall)

272 **Communications and Media Relationships for Associations** (3) Kasle, Adams
Primarily for students in association management. The nature of the communication process, including both interpersonal and organizational communication. Problems and approaches; barriers to good communication. Methods of improving organizational communication. The media and their role; approaches to media relationships. (Spring)

273 **Association Law and Lobbying** (3) Staff
The role of the association in the political process, including the context within which interests are represented before Congress and the executive branch. Interest groups and their ideas and techniques. Rules and regulations governing lobbying activities. (Spring)

274 **Marketing Strategy for Associations** (3) Divita
Analysis of complex marketing problems of associations that involve policy and operational decisions. Creative marketing strategy. Prerequisite: AM 271 (Summer)

275 **Survey of Information Systems and Data Processing for Associations** (3) Staff
Introduction to the concepts of information systems as employed in associations. Data-base management systems, telecommunications systems, small business computers. (Fall)

276 **Organization and Management of Associations** (3) Staff
Integrative approach to organizational and management concepts, theories, and practices, with particular attention to the problems of associations and similar types of organizations. Functions, roles, and responsibilities of the association manager. (Spring)

277 **Financial Management for Associations** (3) Staff
An overview of basic accounting principles and practices as they apply to associations, with attention to the economics of association management and financial planning, reporting, and auditing. Investments, revenues, bonds, debt, government funds. (Fall)

279 **Current Issues in Association Management** (3) Keane
A review of elements of association management, with attention to the number and variety of associations and their responsibilities in present-day society. Particular attention is given to the problems associations face now and will face in the future. A capstone seminar providing a review and synthesis of the Association Management Program. (Fall and spring)

## ASTRONOMY

See **Physics.**

## BIOCHEMISTRY—GRADUATE PROGRAMS

*Professors* J.M. Bailey, A.L. Goldstein *(Chair)*, L.L. Gallo, A. Kumar
*Associate Professors* T. Moody, J.Y. Vanderhoek, R.S. Schulof, G. Fiskum

*Master of Science in the field of biochemistry*—Prerequisite: a bachelor's degree. The undergraduate program must have included the following courses, or equivalent: BiSc 11–12; Chem 11–12, 22, 151–52, 153–54; Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Bioc 221–22, 223, 227, 229, 299–300; Chem 251. The remaining courses are to be selected from Bioc 231, 232, 240, 250, 260, 270, 280. It is expected that students will complete all of the required work in approximately two years.

*Doctor of Philosophy in the field of biochemistry*—Required: the general requirements stated under the Graduate School of Arts and Sciences.

*Research fields:* endocrinology—thymosins, steroid hormones, prostaglandins; immunology—immunochemistry, gene transfer; lipid chemistry and metabolism—essential fatty acids, lipoproteins, complex lipids, cholesterol, peroxides, atherosclerosis, steroidogenesis; nutrition—dietary fiber, dietary fat, trace minerals; neurochemistry—endorphins, enkephalins, nerve growth factors, bombesin; bioenergetics—mitochondria, $Ca^{2+}$ transport, tumor cell metabolism, ischemia.

221–22 **General Biochemistry** (4–4) Gallo and Staff
A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Prerequisite: Chem 152, 154. (Academic year)

223 **Physical Biochemistry** (3) Vanderhoek
Lectures cover basic laboratory techniques used in contemporary biochemical and molecular biological research. (Fall)

225–26 **Introduction to Biochemical Research** (arr.) Fiskum and Staff
Rotation through research projects in laboratory units within the Biochemistry Department to provide individualized in-depth training in the methods and instrumentation used. Limited to graduate students in the department. (Academic year)

227 **Biochemistry Seminar** (1) Fiskum and Vanderhoek
Current literature in biochemistry. Limited to students in the Department of Biochemistry graduate program. May be repeated for credit. (Fall and spring)

229 **Biochemistry of Enzymes** (2) E. Anderson*
Content includes practical handling of enzymes, kinetics, reaction mechanisms, active site, isozymes, regulation, and other special topics. Prerequisite: Bioc 201 or 221. (Spring)

230 **Current Topics in Enzymology** (2) Bailey and Staff
Directed readings in various areas of enzymology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 229.

231 **Bioenergetics** (2) Fiskum
Content includes biochemical thermodynamics, oxidation–reduction processes, oxidative phosphorylation, photosynthesis, and chemiosmotic energy coupling. Prerequisite: Bioc 221–22 or 201. (Fall)

232 **Protein Chemistry** (2) Steers† and Schechter‡
Content includes the theory and methods of protein chemistry, the structure-function relationship of proteins and other special topics. Prerequisite: Bioc 201 or 221. (Fall)

235 **Current Topics in Bioenergetics** (1 or 2) Fiskum
Directed readings in various areas of bioenergetics. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 231.

240 **Nutrition** (2) Walker and Staff
Content includes discussion of RDA, nitrogen balance, vitamins and minerals, diets, and other special topics. Prerequisite: Bioc 201 or 221–22. (Spring)

241 **Current Topics in Nutrition** (1 or 2) Walker and Staff
Directed readings in various areas of nutrition. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 240.

250 **Cell and Molecular Biology** (3) Kumar and Staff
Content includes the organization and replication of genetic material, tran-

* Elizabeth Potts Anderson is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.
† Edward Steers, Jr., is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.
‡ Alan Neil Schechter is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.

scriptional and translational machinery, regulation of eukaryotic gene expression, and other special topics. Prerequisite: Bioc 201 or 221–22. (Fall)

251 **Current Topics in Molecular Biology** (1 or 2) Kumar and Staff
Directed readings in the area of molecular biology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 250.

252 **Biochemical and Molecular Aspects of Selected Diseases** (2) Kumar and Staff
Emphasis on the biochemical and molecular aspects of selected diseases. The format will be of a tutorial type, including presentations of material by students. (Spring)

256 **Biochemical Genetics and Inherited Metabolic Diseases** (1 or 2) Merril
Biochemical aspects of genetics and contributions of molecular biology to understanding of human mutations and hereditary diseases. Prerequisite Bioc 250. (Spring)

260 **Biochemistry of Lipids and Membranes** (2) Vanderhoek
Biochemistry, structure, and function of various lipid classes, membranes, and receptors. Prerequisite: Bioc 221–22. (Spring)

261 **Current Topics in Lipids** (1 or 2) Staff
Directed readings in the area of lipid biochemistry. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite Bioc 260.

262 **Lipoproteins** (2) Gallo
Composition, synthesis, and metabolism of lipoproteins in normal and dyslipoproteinemic subjects. Prerequisite: Bioc 221–22. (Spring)

264 **Membrane-Associated Complex Lipids** (1) Fishman*
Topics cover the catabolism and biosynthesis of complex sphingolipids, inherited metabolic diseases associated with abnormal sphingolipid metabolism, membrane receptors for hormones and toxins, and other special topics. Prerequisite: Bioc 221–22. (Spring)

270 **Biochemistry and Cell Biology of the Immune Response** (2) Naylor† and Staff
Biochemical aspects of the immune response at the molecular and cellular level. Modern experimental approaches to immunology and cell biology. Prerequisite: Bioc 221–22 and Micr 229, or permission of instructor. (Spring)

271 **Current Topics in Immunology** (1 or 2) Goldstein and Staff
Directed readings in the area of biochemical immunology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 270.

280 **Neurochemistry** (2) Moody and Staff
Content includes molecular structure and function of nerve tissue; intra- and interneuronal communication mechanisms; biochemistry of various brain dysfunctions; and other special topics. Prerequisite: Bioc 201 or 221–22 (Fall)

281 **Current Topics in Neurochemistry** (1 or 2) Moody and Staff
Directed readings in neurochemistry. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 280.

295 **Research in Biochemistry** (arr.) Staff
Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

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* Peter Harvey Fishman is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.

† Paul Henry Naylor is Associate Research Professor of Biochemistry in the G.W.U. School of Medicine and Health Sciences.

299–300 **Thesis Research** (3–3)
(Fall and spring) Staff

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## BIOLOGICAL SCIENCES

Professors S.O. Schiff, D.L. Atkins, R.K. Packer *(Chair)*
Adjunct Professors L.S. Kornicker, C.G. McWright
Professorial Lecturers W.A. Shropshire, Jr., H. Hoffman, R.P. Eckerlin
Associate Professors R.E. Knowlton, H. Merchant, T.L. Hufford, D.E. Johnson, J.R. Burns, R. Donaldson
Associate Professorial Lecturers P.E. Spiegler, D. Goldman
Assistant Professors E.F. Wells, K.M. Brown, D.L. Lipscomb, H.B. Wagner, D.W. Morris
Assistant Professorial Lecturer L.D. Killos

*Bachelor of Arts or Bachelor of Science with a major in biology, botany, or zoology (departmental)*—The following requirements must be fulfilled:
1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—BiSc 11–12, or equivalent.

*Bachelor of Arts with a major in biology, botany, or zoology*—In addition to the general requirements listed above, the following must be taken:
1. Chem 11–12; Chem 151–52 *and* 153–54, or Chem 50. (The following courses are strongly recommended: Math 31; Phys 1, 2, 5, and 6; two years of French, German, or Russian; Stat 91 or 127.)
2. (a) Required courses for the major in biology—A minimum of 24 semester hours of second-group courses, which should include at least 6 hours in biology, 6 in botany, and 6 in zoology. In fulfillment of the botany requirements, students may take either BiSc 133 or 137 but not both.
(b) Required courses for the major in botany—A minimum of 24 semester hours of second-group courses; a minimum of 12 hours must be taken in botany, and no more than one zoology course may be included.
(c) Required courses for the major in zoology—A minimum of 24 semester hours of second-group courses; a minimum of 12 hours must be taken in zoology, and no more than one botany course may be included.

*Bachelor of Science with a major in biology, botany, or zoology*—The following requirements must be fulfilled:
1. Required courses in related areas—Chem 11–12; Chem 151–52 *and* 153–54, or Chem 50; Phys 1, 2, 5, and 6; 3 semester hours of either mathematics or statistics (this requirement cannot be satisfied by waiver). Two years of French, German, or Russian are strongly recommended but not required.
2. (a) Required courses for a major in biology—A minimum of 30 semester hours of second-group courses, which should include at least 7 hours in biology, 7 in botany, and 7 in zoology. In fulfillment of the botany requirements, students may take either BiSc 133 or 137 but not both.
(b) Required courses for the major in botany—A minimum of 30 semester hours of second-group courses; a minimum of 15 hours must be taken in botany, and no more than two zoology courses may be included.
(c) Required courses for the major in zoology—A minimum of 30 semester hours of second-group courses; a minimum of 15 hours must be taken in zoology, and no more than two botany courses may be included.

Special Honors—In addition to the general requirements stated under Regulations, in order to be considered for graduation with special honors, a student must maintain a

cumulative 3.5 quality-point index in biological science courses and at least a 3.0 cumulative overall quality-point index.

*Minor in biology*—12 semester hours of second-group courses,* which must include at least 3 hours in biology, 3 in botany, and 3 in zoology.

*Minor in botany*—12 semester hours of second-group courses,* of which 8 hours must be in botany.

*Minor in zoology*—12 semester hours of second-group courses,* of which 8 hours must be in zoology.

*Master of Science in the field of biology, botany, or zoology*—Prerequisite: a bachelor's degree with a major in one of the following from this University, or an equivalent degree: (1) *Biology field*—an undergraduate major in biology, botany, or zoology; (2) *Botany field*—an undergraduate major in botany or biology; (3) *Zoology field*—an undergraduate major in zoology or biology. The undergraduate program must have included the following courses, or equivalent: Chem 151–52 and 153–54, or 50; Math 31; Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The minimum requirement consists of 24 semester hours of approved course work plus a thesis (equivalent to 6 semester hours). With the permission of the department, a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis.

*Master of Arts in the field of museum studies*, with specialization in the biological sciences, see Museum Studies.

*Doctor of Philosophy in the field of biology, botany, or zoology*—Required: the general requirements stated under the Graduate School of Arts and Sciences, plus satisfactory completion of a Preliminary Examination and the General Examination in at least three areas of biology. The program of study and fields of study are determined in consultation with an advisory committee appointed for each candidate.

*Major Research Areas*: ecology, evolution and systematics, plant biology, genetics, cell and molecular biology, developmental biology, vertebrate and invertebrate anatomy and physiology, marine and freshwater biology.

*Master of Science* and *Doctor of Philosophy in the field of geobiology*, see Geobiology.

**Departmental prerequisite:** BiSc 11–12 or equivalent is prerequisite to all second-group courses in biology, botany, and zoology, except by permission of the instructor.

## BIOLOGY

### First Group

Schiff

3–4 **Introductory Biology for Nonscience Majors** (3–3)
Lecture (2 hours), laboratory (2 hours). BiSc 3: Principles of cell biology; structure and function of plants and animals; animal behavior. BiSc 4: Human anatomy and physiology; genetics; evolution; ecology. Prerequisite: BiSc 4: BiSc 3. Laboratory fee, $30 per semester. (Academic year)

Huffaker

11–12 **Introductory Biology for Science Majors** (4–4)
Lecture (3 hours), laboratory (3 hours). BiSc 11: Investigation of principles of inheritance, physiology, development, and cell biology. BiSc 12: Genetics; survey of microorganisms, plants, and animals, including morphology, physiology, embryology, ecology, and evolutionary relationships among phyla. Designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Laboratory fee, $40 per semester. (Academic year)

* BiSc 171 through 176 do not count toward fulfillment of the 12-hour second-group course requirements.

**Second Group**

**103 Marine Biology** (4) Knowlton
Lecture (2 hours), laboratory and field (4 hours), plus some extended field trips. Study of relationships between organisms and physical, chemical, and biological factors of the marine environment. Consideration of the open ocean and coastal ecosystems and man's influence on them. Laboratory fee, $40. (Spring)

**107 Field Biology** (4) Merchant
Field study of altitudinal zonation, species hybridization, territoriality, energy balance, time and energy budgeting, effects of exposure, and effects of introduction of alien species on flora and fauna of Great Smoky Mountains National Park. (Summer, odd years)

**108 Organic Evolution** (3) Lipscomb
Synthetic theory of organic evolution, including population biology, speciation, adaptation, macroevolution, systematics, biogeography, and an overview of the course of evolution from prebiotic Earth to the emergence of man. (Fall)

**111 Introductory Microbiology** (4) Morris
Lecture (2 hours), laboratory (4 hours). Survey of the major groups of microorganisms with emphasis on structure, physiology, ecology, phylogenetic relationships, and economic importance. Prerequisite: one year of chemistry. Laboratory fee, $40. (Fall)

**113 Protistology** (4) Hufford, Lipscomb
Lecture (2 hours), laboratory (4 hours). Examination of the diversity, evolution, morphology, physiology, ecology, and reproduction of both photosynthetic and heterotrophic protists. Laboratory fee, $40. (Spring, even years)

**122 Cell Biology** (3) Morris
Structure and function of biological molecules, viruses, and cellular organelles. Prerequisite: one semester of organic chemistry. (Spring)

**123 Cell Biochemistry** (3) Donaldson
Introduction to the metabolism of generalized cells of animals, plants, and microorganisms, including energetics, enzymes, respiration, biosyntheses, and regulatory mechanisms. Prerequisite: one semester of organic chemistry. (Fall)

**124 Cell Biochemistry Laboratory** (2) Donaldson
Designed to illustrate some of the principles and techniques of biochemical experimentation. Prerequisite or concurrent registration: BiSc 123. Laboratory fee, $40. (Fall)

**127 Genetics** (3) Johnson
Introduction to genetics, with emphasis on the integration of transmission of genetic traits and the chemical basis of gene action. Also includes cytogenetics, gene regulation, and examples of current applications of genetic technology. (Fall and spring)

**128 Genetics Laboratory** (1) Johnson
Study of genetic principles using Drosophila, *E. coli*, and lambda phage. Prerequisite or concurrent registration: BiSc 127. Laboratory fee, $40. (Fall and spring)

**138 Advanced Genetics** (3) Johnson
Emphasis on the use of genetic analysis in solving modern biological problems. Prerequisite: introductory course in genetics. (Spring)

**140 General Ecology** (4) Merchant
Lecture (3 hours), laboratory and field (3 hours). Introduction to the concepts of limiting factors, biogeochemical cycles, trophic levels, and energy transfer and their relationship to the structure and function of population, species, communities, and ecosystems. Laboratory fee, $40. (Fall)

**144 Aquatic Ecology** (4) Merchant
Lecture (3 hours), laboratory and field (3 hours). Principles applied to aquatic systems with special references to physiochemical properties, typical habitats, and communities. Laboratory fee, $40. (Spring, odd years)

150 **Physiological Ecology** (3) Wagner
Lecture (2 hours), laboratory and field (2 hours). Study of physiological adaptations of animals and plants to the abiotic and biotic environment. Prerequisite: BiSc 140 or 141. Laboratory fee, $40. (Fall, even years)

167 **Radiation Biology** (3) Schiff
Chemical, physical, and biological aspects of radiation; effects of radiation on cells and organisms, with emphasis on mammals. Recommended: cell biology and chemistry or physics. (Fall)

168 **Tropical Marine Biology** (4) Knowlton, Packer
Study of relationships between organisms and physical, chemical, and biological factors in a tropical marine-estuarine environment, conducted through ecological fieldwork in characteristic tropical ecosystems on the island of San Salvador, Bahamas. Laboratory investigations on organism physiology. Recommended: BiSc 103 and/or 163. Laboratory fee, $40. (Summer, even years)

169 **Applied Marine Ecology** (4) Knowlton
Field study of interactions among biotic and abiotic components of temperate-boreal ecosystems, with emphasis on man's impact and utilization of coastal resources, conducted through surveys of ecosystems along the Maine coast and associated laboratory work, supplemented by lectures and discussion. Application of ecological and oceanographic research techniques to polluted as well as relatively unspoiled sites. Recommended: BiSc 103 and/or 140. Laboratory fee, $65. (Summer, odd years)

171 **Undergraduate Research** (arr.) Staff
Admission by permission of the staff member concerned. May be repeated for credit. Prerequisite: Chem 50 or 152; 16 semester hours in biological science courses. Laboratory fee, $20 per semester hour. (Fall and spring)

172 **Independent Study in Cell and Molecular Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

173 **Independent Study in Developmental Biology** (2) Brown
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and Spring)

174 **Independent Study in Organismic Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

175 **Independent Study in Genetic and Evolutionary Biology** (2) Johnson, Lipcomb
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

176 **Independent Study in Environmental Biology** (2) Hufford, Merchant
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

185 **Human Nutrition** (3) Staff
Dietary requirements and their underlying physiological and biochemical bases; composition of natural and modified foodstuffs and additives; social and economic aspects of nutrition. (Spring)

**Third Group**

208 **Bioenergetics** (3 or 4) Merchant
Study of energy fixation and transfer in ecosystems and of their role in behavior, evolution, population dynamics, and species interactions. Students

enrolling for 4 credits will devote one additional class meeting per week to an investigation of the nature and methods of science. Prerequisite: BiSc 140 or permission of the instructor. (Fall, odd years)

209 **Seminar: Principles and Mechanisms of Organic Evolution** (3) Lipscomb
Current problems and issues in evolution; speciation, macroevolution, biogeography, and topics of special interest to participants. Prerequisite: BiSc 108 or equivalent. (Fall)

210 **Methods of Study of Evolution** (4) Lipscomb
Lecture (3 hours), laboratory and field (2 hours). Review of selected topics of current interest in the study of evolution, such as principles of phenetic and phylogenetic systematics, study of biogeography, and biochemical methods of examining evolution. Laboratory fee, $40. Prerequisite: BiSc 108 or equivalent. (Fall, even years)

220 **Seminar: Cell or Plant Biochemistry** (3) Donaldson
Course content changes each session, alternating between selected topics in cell biochemistry and plant biochemistry. May be repeated for credit. Prerequisite: BiSc 122 or 123 or 135 or equivalent. (Spring)

227 **Seminar: Genetics** (3) Johnson
Review of selected topics in genetics, with emphasis on current literature; topics of special interest to participants encouraged. May be repeated for credit. Prerequisite: BiSc 127 or equivalent. (Fall, odd years)

228 **Population Genetics** (3) Johnson
Origin, maintenance, and possible significance of genetic variation in populations. Selection, genetic drift, microevolution of species, and speciation are emphasized. Both theoretical and applied aspects of population genetics are discussed. Prerequisite: BiSc 122 or 123 or equivalent. (Fall, even years)

229 **Cytogenetics** (3) Staff
Behavior of chromosomes in mitosis and meiosis as a basis for the transmission of genes from one generation to the next through reproduction and the influence of cytogenetic processes on the mechanisms of evolution. Prerequisite: BiSc 122 or 123 and 127 or equivalent. (Fall)

230 **Human Genetics** (3) Staff
Genetic mechanisms of transmission and expression of human traits, with emphasis on biochemical and cytogenetic aspects. Prerequisite: BiSc 127 or equivalent; previous course work in cell biology or cell biochemistry strongly recommended. (Spring)

243 **Seminar: Ecology** (3) Merchant
In-depth study of selected topics, including reports on original publications. May be repeated for credit. Prerequisite: BiSc 140 or equivalent. (Spring, even years)

248 **Analysis of Development** (3) Brown
Survey of current research in selected topics in experimental morphology, biochemical development, and developmental endocrinology. Emphasis on the principles and problems of pattern formation in animals. Prerequisite: BiSc 145 or equivalent. (Fall, even years)

249 **Seminar: Developmental Biology** (3) Brown
Discussion and reports on recent research on the endocrinological, genetic, and biochemical aspects of animal development. Prerequisite: one course in developmental biology or cell biology. May be repeated for credit. (Spring)

272 **Scanning Electron Microscopy** (3) Atkins
Theory and practice of scanning and transmission electron microscopy, including specimen preparation, photography, and analysis of ultrastructural observations. Laboratory fee, $65. (Spring)

273 **DNA Replication** (3) Morris
A study of the enzymology of DNA replication in viral, prokaryotic, and eukaryotic model systems; positive and negative control theories in DNA replication and the biochemical and genetic evidence supporting these theories. Prerequisite: BiSc 111, 122, or 123. (Spring, even years)

274 **Gene Regulation and Genetic Engineering** (3) Morris
The control of gene expression as illustrated by several prokaryotic and eukaryotic model systems: discussions of recombinant DNA techniques. Prerequisite: BiSc 127. (Fall, even years)

275 **Introduction to Recombinant DNA Techniques** (3) Morris
Lecture, 1 hour; laboratory, 4 hours. Basic techniques of genetic manipulation: isolation of phage and plasmid DNA, cloning of genes, transformation of bacteria, mutagenesis of cloned genes, and other techniques. Prerequisite: BiSc 111 or 122 or 127 or equivalent. Laboratory fee, $40. (Spring, odd years)

295 **Research** (arr.) Staff
Investigation of special problems. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

**Fourth Group** (Applicable to Biology, Botany, and Zoology)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## BOTANY

**Second Group**

105 **Field Botany** (4) Wells
Lecture (2 hours), laboratory and field (4 hours). Field and laboratory studies on local flora. Laboratory fee, $40. (Fall; may be repeated for credit during the summer)

109 **Developmental Plant Anatomy** (4) Hufford
Demonstration, observation, discussion (6 hours). Initiation and ontogeny of tissues and organs of vascular plants. Laboratory fee, $40. (Spring, odd years)

110 **Plant Diversity** (4) Wagner
Demonstration, observation, discussion (6 hours). Evolutionary morphology and life histories as a basis for a phylogenetic study. Laboratory fee, $20. (Spring, odd years)

125 **Flowering Plants** (4) Wells
Lecture (2 hours), laboratory and field (4 hours). Origin, evolutionary development, and principles of systematics of flowering plants. Laboratory fee, $40. (Spring)

126 **Flora of the Mid-Atlantic States** (4) Wells
Field trips and laboratory study of the identification and ecology of vascular plants of the Coastal Plain, Piedmont, and mountains of Delaware, Maryland, Virginia, and West Virginia. Emphasis on family characteristics and recognition of dominant species in native habitats. Weekend trips required. Laboratory fee, $40. (Summer)

135 **Plant Physiology** (4) Donaldson
Lecture (2 hours), laboratory (4 hours). Physiology of seed plants with emphasis on growth, development, tropisms, and reproduction. Prerequisite: Chem 11–12. Recommended: Chem 50 or 151–52. Laboratory fee, $40. (Spring)

141 **Plant Ecology** (4) Wagner
Lecture (2 hours), laboratory (4 hours). Introduction to the dynamics of plant communities, populations, and individuals. Several Saturday and weekend field trips required. Laboratory fee, $40. (Fall)

**Third Group**

221 **Variation and Evolution in Plants** (3) Wells
Biosystematics of plants, covering the literature, concepts, and methodology of chemotaxonomy, breeding systems, cytogenetics, population genetics, and other studies of speciation, evolution, and classification. Prerequisite: BiSc 105 or 108 or 125 or 127. (Spring, even years)

238 **Seminar: Current Topics in Phycology** (3) Hufford
A review of current literature regarding selected aspects of algal systematics, morphology, physiology, or ecology. (Fall, even years)

239 **The Biology of Freshwater Diatoms** (4) Hufford
The systematics, morphology, physiology, and ecology of freshwater diatoms. Field and laboratory studies emphasize familiarity with local taxa. Laboratory fee, $40. (Fall, odd years)

242 **Advanced Plant Ecology** (3) Wells
Review of selected topics in adaptive plant strategies and physiological plant ecology. Prerequisite: BiSc 107 or 140 or 141. (Spring, odd years)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

## ZOOLOGY

**Second Group**

101 **Invertebrate Zoology** (4) Knowlton
Lecture (3 hours), laboratory (3 hours). General survey of invertebrate animals, including classification, morphology, physiology, embryology, and evolutionary relationships among phyla. Laboratory fee, $40. (Fall)

104 **Comparative Vertebrate Anatomy** (4) Atkins
Lecture (2 hours), laboratory (4 hours). Evolution and comparative morphology of chordata, stressing recent forms. Laboratory fee, $40. (Fall)

120 **Animal Behavior** (3) Wagner
An evolutionary approach to the study of animal behavior, emphasizing behavioral ecology and sociobiology. (Spring)

143 **Animal Ecology** (4) Merchant
Lecture (3 hours), laboratory and field (3 hours). Application of ecological principles to the understanding and manipulation of animal populations. Prerequisite: BiSc 140 or permission of instructor. Laboratory fee, $40. (Spring, even years)

145 **Principles of Development** (4) Brown
Lecture (2 hours), laboratory (4 hours). Development of animals, especially vertebrates, with reference to human embryos. Principles are illustrated by modern experimental studies of developmental problems. Laboratory analysis of organ system formation in the frog, chick, and pig. Laboratory fee, $40. (Fall)

146 **Experimental Developmental Biology** (4) Brown
Lecture (2 hours), laboratory (4 hours). Molecular and cellular biology of development through examination of the literature and complementary laboratory experiments. Laboratory exercises involve micromanipulative and biochemical operations on embryos fertilized in the lab. Prerequisite: BiSc 145 or equivalent, or permission of instructor. Recommended: a course in cell biology. Laboratory fee, $40. (Spring)

148 **Histology** (4) Burns
Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Laboratory fee, $40. (Spring)

153 **Survey of Neurobiology** (4) Atkins
Lecture (3 hours), laboratory (2 hours). Study of the gross and cellular anatomy, physiology, and biochemistry of the nervous system; emphasis on mammals. Laboratory fee, $40. (Fall)

155 **Parasitology** (4) Eckerlin
Lecture (2 hours), laboratory (4 hours). Introduction to animal parasitology; survey of parasitic types from protozoa through arthropods. Laboratory fee, $40. (Fall)

157 **Comparative Endocrinology** (4) Burns
Lecture (3 hours), laboratory (2 hours). Comparative study of basic principles of chemical integration, neuroendocrine relationships, and mechanisms of hormone action. Prerequisite: BiSc 104, 165 and/or concurrent registration in Chem 151–52 or 50. Laboratory fee, $40. (Fall)

163 **Human Physiology** (3) Packer
Introduction to the function of organ systems of the human body. Prerequisite: Chem 11–12. (Fall)

164 **Human Physiology Laboratory** (1) Staff
Study of basic physiology laboratory techniques; emphasis on the experimental study of homeostatic mechanisms in humans. Prerequisite or concurrent registration: BiSc 163. Laboratory fee, $40. (Fall)

165 **Advanced Human Physiology** (4) Packer
Lecture (3 hours), laboratory (3 hours). Detailed study of selected organ systems, stressing chemical and physical bases. Prerequisite: BiSc 163 and 164, or equivalent. Prerequisite or concurrent registration: Chem 151–52 or 50. Laboratory fee, $40. (Spring)

166 **Ornithology** (4) Wagner
An introduction to the study of birds from an ecological perspective. Includes visits to the collections and exhibits of the Smithsonian Institution's Museum of Natural History and National Zoological Park, several short field trips, two full-day Saturday trips for waterfowl and migrants, and one evening field trip for owls. Laboratory fee, $30. (Spring, even years)

**Third Group**

204 **Seminar: Invertebrate Zoology** (3) Knowlton
Review of selected topics in physiology, development, and ecology of invertebrate animals, including reports on original publications. May be repeated for credit. Prerequisite: BiSc 101 or equivalent. (Fall)

211 **Symbiosis and Evolution** (3) Lipscomb
Study of the adaptations and evolution of parasites, including coevolution of parasites and hosts, competition for hosts, evolution of life cycles, and topics of special interest to participants. (Spring, odd years)

212 **Seminar in Comparative Reproductive Biology** (3) Burns
Review of selected topics in animal reproduction, including neuroendocrine regulation, reproductive cycles and behavior, and gonadal pathology. Prerequisite: BiSc 165 or equivalent. (Spring)

252 **Seminar: Neurobiology** (3) Atkinson
Study of current publications in comparative neurobiology. May be repeated for credit with instructor's permission. (Spring, even years)

256 **Fish Physiology** (3) Packer
A survey of major organ systems and homeostatic mechanisms of fishes with emphasis on teleosts. Prerequisite: BiSc 163 or 150 or equivalent. (Spring, odd years)

265 **Epithelial Transport** (3) Packer
A survey of cellular mechanisms of electrolyte, water, and metabolite transport, with emphasis on osmotic and acid–base balance. (Fall)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

## BUSINESS ADMINISTRATION

*Professors* R.B. Eastin, H.R. Page *(Emeritus)*, F. Amling, G. Black, P.D. Grub, N.M. Loeser, G.P. Lauter, A.I. El-Ansary *(Chair)*, B. Burdetsky, S.F. Divita, R. Eldridge, R.F. Dyer, W.C. Handorf, **S.N. Sherman, W.J. Winstead** *(Visiting)*, F. Ghadar, Y.S. Park, H.G. **Askari, H.J. Davis, S.W. Dunn** *(Distinguished Visiting)*
*Professorial Lecturers* S.A. Seelig, D.A. Peterson, A. Hammad, **D.L. Edgell, N. Bruck,** J.H. Joseph, C.W. Ervin
*Associate Professors* R.L. Holland, J.M. Sachlis, P.B. Malone III, D.J. Lenn, M.L. Liebrenz-Himes, L.M. Maddox, J.B. Thurman, J.H. Perry, T.M. Barnhill, N.G. Cohen, J.A.R. Guertin *(Visiting)*, F. Robles, M.S. Katzman, J. Cook *(Visiting)*
*Associate Professorial Lecturers* T.J. Curry, D.M. Devaney, R.J. Gould
*Assistant Professors* D.R. Kane, P.S. Peyser, C.C. Shepherd, Jr., E.J. Englander, T.E. McCue, D.B. Smith, D. Smith Cook, S.B. Jenkins, B.L. Sudweeks *(Visiting)*
*Assistant Professorial Lecturers* W.N. LaForge, M. Regalia, G.I. Friend, B. Madigan, T.F. Shine, J.M. Goldstein, L.P. Katsanis
*Instructor* G.M. Jabbour *(Visiting)*
*Lecturers* J.A. Gillis, M.B. Humber, M.A. Oyhenart, G.E. De Graff, R. Kramer, A. McGregor, T.O. Singer

See the School of Government and Business Administration for programs of study in business administration leading to the degrees of Bachelor of Business Administration, Master of Business Administration, and Doctor of Philosophy.

### First Group

51 **Introduction to Business** (3) Davis, Katzman, Thurman, Smith Cook
Structure, activities, and problems of business enterprise; its contribution to the individual and society; careers in business. (Fall and spring)

### Second Group

101 **The Business Environment** (3) Lenn, Englander
Economic and legal environment of business enterprise; social and political influences; contemporary problems and issues. Restricted to seniors in the B.B.A. program. (Fall and spring)

104 **Business and the Legal System** (3) Shepherd, LaForge
General overview of the legal system, role of law, and key legal concepts such as torts and contracts. Specific business applications—antitrust, employer obligations, organization of business enterprise, securities regulation, international law. (Fall and spring)

110 **Personnel Management** (3) Burdetsky, Malone
The labor force and labor markets. Industrial personnel and manpower programs, organization and policy in personnel activities. (Fall and spring)

115 **Leadership in Personnel Management** (3) Burdetsky
A study of the philosophy, principles, policies, and programs for effective personnel management and industrial relations as portrayed by case studies drawn from business and government. Prerequisite: BAd 110. (Fall)

117 **Collective Bargaining** (3) Burdetsky
American unionism and collective bargaining; economic, social, and public policy considerations. The negotiation and administration of collective bargaining agreements. Prerequisite: BAd 110. (Spring)

120 **Business Finance** (3) Handorf, Cohen, McCue, Jenkins
Analyzing capital requirements and methods of acquiring funds; planning efficient use of capital. Asset management, financial analysis, sources of funds, capital budgeting, and cost of capital. Prerequisite: Accy 51–52; Econ 1; Math 51–52; Stat 51. (Fall and spring)

123 **Investment and Portfolio Management** (3) Amling, Cohen
Theory and principles of security analysis and portfolio management, including analysis of the national economy, industry, company, and security

markets. Risk–reward and computer-aided analysis. Prerequisite: BAd 120. (Fall and spring)

124 **Advanced Financial Management** (3) Handorf, Barnhill, McCue
Analysis and readings investigating the theoretical relationships underlying financial management. Emphasis is placed upon cases for decisions involving long-term assets, financing, dividend policy, and other special topics in finance. Prerequisite: BAd 120. (Fall and spring)

130 **Working Capital Management** (3) Cohen
The analysis of corporate short-term sources and uses of funds. Optimization techniques and case studies emphasized. Bank lending practices are evaluated within the working capital area. Prerequisite: BAd 120. (Spring)

132 **Real Estate Investment** (3) Handorf
Principles of real estate investment, including valuation, appraisal, financing, and development, in addition to a discussion of the mortgage market and its institutions. Prerequisite: BAd 120. (Fall and spring)

133 **Fundamentals of Insurance and Risk Management** (3) Cohen
Functions of insurance and risk management in business enterprise. (Spring)

135 **Capital Formation** (3) Handorf
The process of capital formation in a free enterprise economy. Roles of business firms, financial intermediaries, money and capital market institutions, governmental regulatory agencies, fiscal and monetary policies. Prerequisite: BAd 120. (Fall and spring)

140 **Basic Marketing Management** (3) El-Ansary, Dunn, Maddox, Smith
Role of marketing in the socioeconomic system, consumer behavior analysis, impact of consumerism. Major decision areas of product planning, pricing, and distribution; tools of marketing research and demand analysis. Prerequisite: Econ 1–2, Stat 51. (Fall and spring)

142 **Consumer Behavior** (3) Dyer, Maddox, Smith
An examination of the social, cultural, and psychological factors influencing the behavior of consumers. Topics include models of buyer behavior, consumption patterns, market segmentation research, attitude formation and change, brand loyalty, adoption of innovations, and store choice decisions. Marketing management and public policy implications of consumer research studies are stressed. Prerequisite: BAd 140. (Fall and spring)

143 **Marketing Research** (3) Dyer
Basic methods and techniques of marketing research, problem definition, data collection, market survey and experimental design, data analysis and presentation. Special topics: questionnaire construction and data analysis with statistical software packages. Prerequisite: BAd 140, Stat 51, Mgt 58. (Fall and spring)

148 **Advertising** (3) Maddox, Dunn, Dyer
Planning an advertising campaign. Consumer and market information, message appeals, media selection and scheduling, measuring effectiveness. Current criticism and regulation of the advertising function. Other major marketing communication tools, including personal selling and sales promotion. Prerequisite: BAd 140, 142. (Fall and spring)

149 **Advanced Advertising Campaigns** (3) Maddox
An application of the principles of marketing and advertising to a real-world situation in the development of an advertising campaign. Students work in an advertising agency atmosphere to perform such tasks as situation analysis, market segmentation, marketing research, media selection, and copywriting in the preparation of the advertising campaign. The culmination is the presentation of the campaign at a national competition sponsored by the American Advertising Federation. Five students from the class will be selected as presenters. Prerequisite: BAd 140, 142, 143, 148, or permission of instructor. (Spring) Dyer

150 **Salesmanship and Sales Management** (3)
Development of personal selling and presentation skills; examination of types of selling situations. Organization of sales department, sales planning,

forecasting, quotas, territories, performance standards, and analysis and control of distribution costs. Prerequisite: BAd 140. (Fall and spring)

152 **Retailing Management** (3) El-Ansary
A study of retailing management and strategy covering the current environment of retailing, retail market and financial analysis, store location and design, inventory management, and non-store and service retailing. Industry executive and student presentations and case analyses. Prerequisite: BAd 140. (Fall)

159 **Marketing: Strategic Planning** (3) El-Ansary, Dyer, Liebrenz
A capstone seminar for marketing majors. Analytical integration of material covered in previous marketing courses. Marketing strategy literature, financial dimensions of marketing management, and comprehensive cases. Prerequisite: BAd 140, 142, 143, 150, and one additional marketing major field course. (Fall and spring)

160 **Introduction to International Business** (3) Robles
Social, cultural, political, legal, and technological environment of multinational business, emphasizing host-government multinational corporation interface. Terminology, trade uses and practices, conditions essential for successful business operations, including export and import procedures, documentation, and legal requirements; physical movement of goods in international business. (Fall and spring)

166 **International Marketing Management** (3) Lauter, Robles
Scope of international markets, factors in assessing world marketing opportunities; international marketing product, pricing, distribution, and promotion program development in dynamic world markets and global environment. Prerequisite: BAd 140. (Fall and spring)

168 **Foreign Market Analysis** (3) Grub
Patterns of world trade by country, commodities, and products; selected regional analyses, in-depth market studies. Prerequisite: BAd 160, 166. (Fall and spring)

171 **International Business Finance** (3) Eldridge, Sudweeks
Analysis of the international economic environment and its influence on corporate financial management of international operations. Prerequisite: BAd 120. (Fall and spring)

173 **International Banking** (3) Ghadar, Park
Theory and practice of international banking; analysis of international commercial and investment banking from a management perspective; subjects include current international monetary and financial environment, money in capital markets, and topical problems of international banking from a management perspective. Prerequisite: BAd 171. (Fall and spring)

175 **International Monetary and Financial Issues** (3) Eldridge
International macro- and micro-issues of money, banking, and finance. Interrelationship, from a management perspective, of basic forces shaping international and financial policy. Topics include international monetary systems, Eurocurrency markets, LDC debt crises, role of the International Monetary Fund and World Bank, and development banking issues. For advanced undergraduate students with a background in international business finance. Prerequisite: BAd 171 or permission of instructor. (Fall and spring)

180 **Materials and Purchasing Management** (3) Perry, Sherman
Product and nonproduct purchases and materials cycle management. Requirements planning and make-or-buy decisions. Source identification, qualification, and selection. Pricing, inventory, control systems, buying practices, purchase records. Policy and procedure development, ethical questions. Case analyses (Fall and spring)

181 **Management of Public Acquisitions** (3) Perry, Sherman
Requirements planning, regulatory and policy environment, programming and budgeting factors, solicitation and award methods pertinent to public

procurement, strategies, international purchasing, public grants, audit, and ethical considerations. (Fall)

182 **Transportation Management** (3) Perry, Sherman
Transportation systems of the United States. Economic role, modes of transport, international perspectives, private and public finance, policy issues. Traffic management, carrier management. Regulatory change, energy, environmental and safety concerns. (Spring)

183 **Logistics Management** (3) Perry
Physical distribution and customer service management. Storage, inventory, financial and information implications. International distribution. Strategy formulation for the logistics system. Case analyses. (Fall)

184 **Contract Management** (3) Sherman
The unique relationships created when independent organizations are joined by contract over long periods. Terms and conditions, specifications, information flow, progress monitoring. Direction and control problems, property issues, financial relationships, changes, schedule adherence, negotiation, termination, and audit problems. (Spring)

188 **Managing Production/Operations** (3) Holland, Perry
Basic principles and methods of manufacturing production. Manufacturing facilities, plant, and equipment. Illustrations selected from various process and fabrication industries. Prerequisite: Math 51, 52; Stat 51 or equivalent; BAd 110, 191. Restricted to seniors in the B.B.A. program. (Fall and spring)

190 **Special Topics in Business Administration** (3) Staff
Experimental offering; new course topics and teaching methods.

191 **Fundamentals of Management** (3) Davis, Malone, Thurman, Katzman, Smith Cook
Planning, organizing, directing, coordinating, and controlling activities of the administrative unit; evolution of management thinking. (Fall and spring)

192 **Small-Business Management** (3) Holland
Theory and practice of small-business management. Focus on effective management of small firms, essentials of planning and organizing the firm, financial and administrative controls, evaluation of alternative business forms, and comparison of purchase of an ongoing firm, franchising, and new business start-ups. The role of small business in American society; historical perspective of entrepreneurship. Prerequisite: BAd 191. (Fall)

197 **Strategy Formulation and Implementation** (3) Thurman, Katzman, Malone, Smith Cook
An integrative capstone course, covering the concept of strategy, tasks and processes of strategy and policy formulation and implementation, and ramifications of aligning the functional and behavioral processes of the organization to facilitate accomplishment of the organization's mission and objectives. The course develops the student's skills in conducting situation audits, diagnosing organizational problems, formulating and selecting strategic alternatives, and recognizing problems inherent in strategy implementation. Methodology includes case analyses, decision simulations, and lectures. Restricted to seniors in the B.B.A. program. Prerequisite: BAd 110, 120, 140, 191, and 188. May be taken concurrently with BAd 188. (Fall and spring)

199 **Individual Research** (arr.)
Assigned topics. Admission by prior permission of advisor. May be repeated once for credit. (Fall and spring)

**Third Group**

201 **Social and Legal Environment of Business** (3) Kane, Shepherd
This course is a First-Level requirement for M.B.A. students; it may not be used to satisfy a Second-Level requirement. Contemporary social forces acting on business management, business responsibility, ethics. The American legal system, federal regulation, constitutional and administrative law

Business and public policy. Emphasis on court decisions relating to business. (Fall and spring)

202 **Business–Government Relations** (3) Lenn, Englander
Economic, political, and philosophical foundations of the business–government relationship in theory and practice. Antitrust, public utility, and other regulation, consumer and environmental protection, conditions of employment; effective business response—present status and future prospects. Prerequisite: BAd 201 or equivalent. (Fall and spring)

203 **Federal Government Regulation of Society** (3) Tolchin
Same as PAd 216.

204 **Regulation of Business: Administrative Law** (3) Kane
Principles of federal regulation of business through administrative bodies. Analysis of sources and limits of the powers and prerogatives of administrative bodies in adjudicative, executive, and rule-making functions. Theoretical and practical aspects of regulations; other topics. Prerequisite: BAd 201, 202 or equivalent. (Fall)

205 **Business Representation and Lobbying** (3) Joseph
Strategies, tactics, and techniques used by business in representing itself to the legislative and executive branches and regulatory agencies of the federal government. Legal and practical constraints. Ethical considerations. (Fall)

206 **Applied Microeconomics** (3) Staff
Applications of economic theory to public and private decisions affected by the economic and general business environment. Demand, production, costs, profits, investments, inventory, market structure. Prerequisite: Econ 217 and Mgt 270 or equivalents. (Spring)

208 **Macroeconomic Policy and Business** (3) Staff
Interpretation of economic conditions in the short and long run: theory and practice of monetary and fiscal policy; applications of business conditions analysis to business planning, management, and policy. Prerequisite: Econ 218 and Mgt 270 or equivalents. (Fall)

209 **Seminar: Business Economics and Public Policy** (3) Lenn
Analysis and discussion of selected issues by students and representatives of government and business. Prerequisite: BAd 201, 202, or equivalent. (Spring)

210 **Personnel Management** (3) Eastin, Loeser, Malone
Survey of personnel management practices and procedures, including labor–management relations. Same as PAd 231. (Fall and spring)

211 **Seminar: Personnel Management** (3) Burdetsky, Eastin, Katzman
Industrial personnel and manpower management, research in advanced problems. (Spring)

212 **The Personnel Manager** (3) Eastin, Malone
The personnel manager and his or her place in the organization, relation to other executives, policy role, and relations with chief executive. Problems of the senior personnel executive. Prerequisite: BAd 210 or permission of instructor. Same as PAd 232. (Summer)

215 **Leadership and Executive Development** (3) Loeser
Theories of managerial leadership; issues and problems associated with leadership in large organizations and at higher management levels; executive selection and development. Prerequisite. Mgt 205 or permission of instructor. (Fall and spring)

217 **Unionism and Collective Bargaining** (3) Burdetsky
The American labor movement. Collective bargaining and the conduct of labor relations under collective bargaining agreements. (Fall)

218 **Current Issues in Unionism, Collective Bargaining, and Labor Relations** (3) Burdetsky
Current problems and issues. (Spring)

220 **Business Financial Management** (3) Sachlis, Peyser, McCue, Jenkins
This course is a First-Level requirement for M.B.A. students; it may not be

used to satisfy a Second-Level requirement. Theory, policy, and practice in financial management; financial analysis, sources of funds, investing, capital planning, and budgeting. Prerequisite: Accy 201, Econ 217, Mgt 218 and 270, or equivalents. (Fall and spring)

221 **Financial Decision Making** (3) Sachlis, Peyser, McCue, Jenkins
Theory and practice of business finance, emphasizing the impacts of long- and short-term uses and sources of funds on the firm's value. Prerequisite: BAd 120 or 220. (Fall and spring)

222 **Seminar: Capital Formation** (3) Handorf, Jenkins
Determinants of saving and investment and resultant funds flow are evaluated. Special emphasis on the level and risk structure and term structure of interest rates. The role and management of financial institutions is stressed. Prerequisite: BAd 120 or 220. (Fall and spring)

223 **Investment Analysis and Portfolio Management** (3) Amling, Cohen
Risk–reward analysis of security investments, including analysis of national economy, industry, company, and market; introduction to portfolio management; emphasis on theory and computer methods. Prerequisite: BAd 120 or 220. (Fall and spring)

224 **Financial Management** (3) Cohen, Barnhill, McCue
Cases in financial management; planning financial structure, obtaining and managing capital, issuing and placing securities, administering income security arrangements. Prerequisite: BAd 221. (Fall and spring)

225 **Economic, Social, and Legal Aspects of Urban Development** (3) Fuller
Same as U&RP 259. Examination of the forces that shape urban development; introduction to market analysis methods and techniques to evaluate project feasibility; study of the institutional and legal framework within which urban development occurs and that influences controls, land value, and development potential; and analysis of roles and responsibilities of the public and private sector in the urban development process. Prerequisite: Completion of Common Body of Knowledge courses. (Fall)

226 **Financing Urban Development** (3) Handorf, McCue
Principles of development finance: evaluating and measuring the investment attractiveness of real estate projects; obtaining, differentiating, and hedging sources of real estate funding; and appraising property. Although emphasis is on the private sector, the importance of financial conditions of and incentives provided by local, state, and federal governments is considered. Prerequisite: BAd 225 or permission of instructor. (Fall and spring)

227 **Problems in Urban Development** (3) McCue
Applications of market analysis, valuation, and financial techniques to the development process. Prerequisite: BAd 225/U&RP 259 and BAd 226; must be taken concurrently with BAd 228/U&RP 264. (Spring)

228 **Urban Development Planning and Design** (3) Greene
Same as U&RP 264. Application of planning/design principles and techniques in a studio/laboratory environment. Field reconnaissance and graphic techniques applied to projects in site selection, site analysis, concept formulation, and site planning in an urban context. Public and private sector issues are addressed in the preparation of a project development proposal. Prerequisite: BAd 225/U&RP 259 and BAd 226; must be taken concurrently with BAd 227. (Spring)

231 **Seminar: Investment and Portfolio Management** (3) Amling
Portfolio management theory, application, and computer modeling. Independent research on investment analysis and portfolio management with emphasis on theory, cases, and computer applications. Prerequisite: BAd 223. (Fall)

232 **Real Estate Finance** (3) McCue, Seidel
Investment in and financing of real estate from the points of view of the developer, investor, borrower, and lender. Emphasizes vocabulary and identification of significant issues. Develops key analytical tools. Prerequisite: BAd 220. (Spring)

235 **Futures Markets: Speculation and Hedging** (3) Barnhill
Organization and regulation of futures markets. Computer assistance of large data bases. Alternative strategies for profitable speculative trading of futures contracts for possible hedging uses. High risk–high return investment alternatives. The use of futures markets to manage risks caused by fluctuating interest rates, exchange rates, or commodity prices. Prerequisite: Introductory courses in economics, statistics, computer usage, and financial management. (Fall and spring)

239 **Financial Theory** (3) Peyser, Sachlis
In-depth theoretical analysis of business financial topics, including asset management, financial structure, dividend policy, and the capital asset pricing framework. Prerequisite: BAd 221, 223. Offered every third semester.

240 **Marketing Management** (3) Dyer, Divita, El-Ansary, Liebrenz, Smith
This course is a First-Level requirement for M.B.A. students; it may not be used to satisfy a Second-Level requirement. Emphasis on the marketing process from the viewpoint of the firm. Market analysis, product planning, channels of distribution, pricing, and promotional decision making; developing an integrated marketing plan. Prerequisite: Econ 217–18. (Fall and spring)

241 **Advanced Marketing Management** (3) Divita, Liebrenz
For M.B.A. students in concentrations other than marketing. Case analysis of complex marketing problems. Current developments in marketing practice. The relationship of marketing to environmental forces and other business functions. Prerequisite: BAd 240. (Fall and spring)

242 **Buyer Behavior** (3) Dyer, Smith
Examination of theory and recent research concerning buyer decision processes. Interdisciplinary behavioral science studies on individual, family, and organizational purchase behavior are treated. Present and potential applications for marketing in the public and private sector are illustrated with cases. Prerequisite: BAd 240 or permission of instructor. (Fall)

243 **Marketing Research** (3) Dyer
The marketing research process: designing, conducting, and using market research studies. Survey and experimental designs. Data analysis with statistical software packages. Prerequisite: BAd 240, Mgt 218 and 270, or equivalent. (Fall)

246 **Marketing of Services** (3) Liebrenz
Management of the activities involved in marketing new and existing services. The innovation system (behavioral and organizational) of service product decisions, product planning processes, marketing auditing, services and the law, and new service trends. Marketing of intangibles and services is highlighted. Prerequisite: BAd 240. (Spring)

248 **Advertising and Sales Promotion** (3) Dyer, Maddox
Examination of advertising and sales promotion from a systems perspective supported by analytical methods and concepts regarding consumer attitudes and behavior. Topics: social context of promotion, role of communication in marketing, behavioral concepts and communications research, message design, economic and financial criteria, development of a promotion program. Prerequisite: BAd 240. (Spring)

250 **Selling and Sales Management** (3) Divita
The sales function from the viewpoints of the sales person and the sales manager. The first part of the course will focus on the selling task, with attention to ethical and legal issues, the selling process, human behavior and selling, account management and internal selling, negotiation and non-selling aspects of sales work. The second part of the course will focus on the managerial issues associated with sales management, with attention to demand analysis and resource allocation, financial planning, quota setting and control, motivation, coaching and incentives, sales administration, and analysis of sales performance. Prerequisite: BAd 240. (Spring)

253 **Marketing Channels** (3) El-Ansary, Perry
Marketing channels and vertical marketing systems from a managerial viewpoint. Marketing channels viewed as super-organizations requiring planning, organization, coordination, and control. These tasks require an understanding of the channel's task environment, manufacturing, wholesaling, retailing, and physical distribution institutions. Focus on system performance and management of interorganizational relationships among channel institutions. Prerequisite: BAd 240. (Fall)

257 **Marketing and Public Policy** (3) Divita, Gillis
Examination of principal areas of public policy formulation affecting marketing practice. Topics: advertising, warranties, product safety, health issues, consumer information systems, informal and formal redress mechanisms, business responsibilities. Government, business, and advocate viewpoints presented. Prerequisite: BAd 240 or permission of instructor. (Fall)

259 **Marketing Strategy** (3) Divita, El-Ansary
Analysis of complex marketing problems involving policy and operational decisions; emphasis on creative marketing strategy. Prerequisite: completion of at least three Second-Level marketing courses or permission of instructor. (Spring)

261 **Multinational Corporations in the World Economy** (3) Ghadar, Grub
Business in the world economy; multinational corporations as economic, political, and social institutions; ownership and growth strategies, relationships to other nations; national and international controls; future of the multinational corporation. (Fall and spring)

262 **Seminar: International Trade** (3) Eldridge, Edgell
Classical and modern concepts of international trade theory, instruments and institutions of trade policy, barriers to trade, preferential treatment and trading blocs, trends and issues. (Fall and spring)

263 **Legal Aspects of International and Multinational Business** (3) Peterson
Legal environment of international and multinational business including legal systems, antitrust laws, regulation of direct investment, international arbitration and expropriation; topics of current interest. (Fall and spring)

266 **International Marketing** (3) Lauter, Rober-
Organizational structures. Analysis of international markets. Market-entry strategies and product policies. Special issues. Channels of distribution, promotional and price policies. Prerequisite: BAd 240. (Fall and spring)

267 **Regional International Marketing Systems** (3) Lauter
Discussion of the political, economic, legal, and social characteristics of Europe, Japan, Latin America, Asia, the Middle East, Eastern Europe and China, as they affect the marketing of goods and services in these regions. Identification of appropriate market-entry strategies. (Fall and spring)

271 **International Business Finance** (3) Ghadar, Pa-
Analysis of problems in international business finance. Impact of the evolving international payments system on business. Prerequisite: BAd 120 or 220. (Fall and spring)

273 **Seminar: International Banking** (3) Park, Ghadar
International financial intermediation and international banking. Functioning of international financial markets, public policy issues in international banking, regulation of multicountry banking institutions, and the effect of international banks on national monetary policies. Prerequisite: BAd 271. (Fall and spring)

275 **External Development Financing** (3) Ghadar, Park
Problems and alternative solutions for required capital formation and the financing of payment imbalances through external sources. Institutions and instruments for financing national development. Emphasis on planning, affected by energy policies, inflation, recession, changes in the international monetary system, and revised attitudes among developed countries regarding bilateral and multilateral assistance. Prerequisite: BAd 271 or permission of instructor. (Fall and spring)

276 **Seminar: International Financial Markets** (3) Park
Theory and practice of international financial markets. Operation and structure of the Eurocurrency market, such as interbank operations, Eurodollar CDs, and floating-rate Eurocredits. Control of the Eurocurrency market and the role of other financial centers. Study of Eurobond and floating-rate note markets as well as major foreign bond markets. Prerequisite: BAd 271 or 273. (Fall and spring)

277 **International Portfolio Selection and Management** (3) Sudweeks
Theoretical knowledge and practical skills necessary for the efficient management of international financial asset portfolios. Numeraire currency, exchange rates, international taxation, international portfolio optimization, international financial assets and markets, performance measures and applications. Emphasis on computer-based analysis. Prerequisite: Econ 217–18; Accy 201; Mgt 205, 218, 270; BAd 201, 220, 223, 240. (Spring)

278 **International Business Negotiations** (3) Ghadar
This course focuses on the essential characteristics of International Business Negotiations (IBN) with particular emphasis on the process and changes in that process over time. Formulation of concepts and preliminary frameworks to assist in understanding IBN; development of systematic approaches to planning for and conducting IBN. The course assists in developing skills of the participants in the art of IBN while integrating other functional and international aspects in the broader environmental framework. Prerequisite: BAd 261. (Fall and spring)

280 **Purchasing and Materials Management** (3) Page, Perry, Sherman
Industrial purchasing and materials management principles and practices. Organization and functions in materials management. Determination of requirements, source selection, buying practices, policies, and ethics. Same as PAd 280. (Fall and spring)

281 **Procurement and Contracting** (3) Perry, Sherman
Principles and concepts essential to effecting large procurement programs. Planning, sourcing, and contractual design for diverse acquisitions. Emphasis on federal government policy with comparison of buying at other governmental levels and the private sector. Same as PAd 281. (Fall and spring)

282 **Government Contract Administration** (3) Sherman
Surveillance and management of contract performance. Measurement of progress; specification interpretation; quality assurance; changes, negotiation, and adjustment; financial considerations; property; terminations; regulatory and policy concerns. Same as PAd 282. (Spring)

283 **Pricing and Negotiation** (3) Sherman
Scope and objectives of negotiated procurement; preparation, conduct, and recording of negotiations; analysis of cost, price, profit, investment, and risk; cost principles; incentives; relationship of contract type to work requirements; techniques of negotiation. Same as PAd 283. (Fall)

285 **Systems Procurement and Project Management** (3) Sherman
Major systems acquisition: needs, objectives, and organizational relationships. Design, establishment, and execution of project management plans and procurement processes. Analysis of cases in public- and private-sector contractual or assistance activities. Same as PAd 285. (Fall and spring)

286 **Physical Distribution Management** (3) Perry, Sherman
Transportation and communications services management, including optimization of cost and service in terms of full coordination of demand and supply patterns. Alternatives available to the physical distribution manager, given the economic characteristics, competitive conditions, and regulatory environment of the several transportation modes. Model location theory and distribution network planning and design. Prerequisite: Accy 201; Mgt 205, 218, 270; Econ 217–18, BAd 201, 220, 240. (Fall)

287 **Production and Inventory Control Systems** (3) Perry
Inventory and production control concepts, techniques, and strategies for effective integration with basic finance, marketing, and manufacturing objec-

tives. Forecasting methods, material requirements planning systems, distribution requirements planning techniques, and classical reorder-point inventory models. Mechanized inventory–production control systems are examined to highlight design issues in systems development and execution. Prerequisite: Accy 201; Mgt 205, 218, 270; Econ 217–18; BAd 201, 220, 240. (Spring)

288 **Operations and Logistics Management** (3) Perry
Management of work in production, commercial, service, and public organizations. Analytical tools for planning and establishing operating systems and for their operation, control, and modification. Examination of processes, products, services, equipment, and facilities. Relationships of human systems and operating systems. Prerequisite: Accy 201; Mgt 218, 270; Econ 217–18, BAd 201, 220, 240. (Fall)

289 **Strategy Development in Manufacturing and Operations** (3) Holland, Perry
Basic production methods and techniques that influence formulation of a firm's strategic policy for today's competitive environment. Traditional as well as new and improved systems for controlling capacity and output. Productivity analysis, cost control, materials planning, and other topics are examined in the development of a production strategy to ensure that the production function contributes to the overall profit of a firm in an optimal manner. Prerequisite: Accy 201; Mgt 205, 218, 270; Econ 217–18; BAd 201, 220, 240. (Spring)

290 **Special Topics in Business Administration** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated once for credit.

291 **Ethics and Business** (3) Griffith and Lenn
Concepts and strategies of ethical analysis applied to specific business problems, e.g., risk management, plant relocation, preferential hiring, political advertising; development of theory of corporate social responsibility. Same as Phil 235. (Spring)

292 **New Venture Initiation** (3) Staff
Theory and practice of entrepreneurship and small business management. Historical perspective of entrepreneurship in the U.S. and abroad, essentials of planning a new business venture, sources of financing, evaluation of alternative new business ventures, and analysis of business functions needed to get started. Ongoing firms, franchising options, and new business start-ups. Prerequisite: Mgt 218, 270; Econ 217–18; BAd 201, 220, 240; Accy 201. (Fall and spring)

293 **American Business History** (3) Becker
The history of American business institutions in manufacturing, distribution, transportation, and finance. Particular attention will be given to the period since industrialization, with consideration of business institutions in their economic, legal, governmental, and social contexts. Same as Hist 220. (Fall) Staff

294 **Modeling and Analysis for Business Decisions** (3)
Modern business modeling and analysis methods used to solve business problems, with advanced applications from many fields of business. Emphasis on the integrated use of business methods, quantitative methods, and computers to reduce the risk associated with the management of a modern business entity. Prerequisite: Econ 217–18; Accy 201; Mgt 205, 218, 270; BAd 201, 220, 240; or equivalent with permission of instructor. Same as Mgt 274. (Fall) Davis

295 **Research Methods** (3)
Theory and practice in research methodology. Data sources and gathering, research models and designs, analysis and testing, controls, interpretation and presentation of findings. Use of computer library programs and preparation of a formal business report. (Fall)

297 **Strategy Formulation and Implementation** (3) Eastin, Davis, Thurman, Katzman, Smith Cook
A required course for all M.B.A. students; it must be taken during the last semester of the program and may not be waived. The course provides an integrative approach to strategic management, stressing the general manager's perspective. It covers strategy formulation, implementation of strategy and policy, and evaluation and control of strategy in various types of organizations. Skills in strategic thinking and problem solving are emphasized, including scanning external environments, mobilizing and allocating organizational resources, selecting appropriate strategic alternatives, modifying organizational structures, and influencing organizational behavioral processes to facilitate achievement of the organization's purpose, goals, and objectives. Methodology includes case analyses, lectures, and decision simulations. Student ability to articulate strategic concepts is emphasized. Prerequisite: advanced master's degree standing and completion of at least eight Second-Level M.B.A. courses. (Fall and spring)

298 **Directed Readings and Research in Business Administration** (3) Staff
Supervised readings or research in selected fields within business administration. Admission by prior permission of instructor. May be repeated once for credit. (Fall and spring)

299 **Thesis Seminar** (3) Staff
Examination of thesis standards, research philosophy, and methodology. (Fall and spring)

300 **Thesis Research** (3) Staff
(Fall and spring)

**Fourth Group**

Fourth-group courses are primarily for doctoral students. They are offered as the demand requires. They are open to selected master's students upon petition approved by the Associate Dean.

311–12 **Seminar: Public–Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society. Prerequisite: doctoral degree candidate status. (Fall and spring)

321 **Seminar: Financial Markets** (3) Sachlis, Peyser
Research seminar in corporate financial theory, investment portfolio theory, and capital market theory. May be repeated once for credit. Prerequisite: BAd 222, 231, 239. Offered every third semester.

341 **Seminar: Marketing** (3) El-Ansary, Dyer
Examination of major theoretical developments in marketing. Topics include advances in marketing theory, services marketing, and marketing for nonprofit organizations. Emphasis on emerging concepts in consumer behavior, channels, marketing communication, and marketing information systems. Offered every third semester.

361 **Colloquium on International Business** (3) Eldridge, Ghadar
Examination of selected topics in international business, with emphasis on major new theoretical and empirical developments. (Fall)

381 **Seminar: Materials and Operations Management** (3) Perry, Sherman
Recent developments in manufacturing production and materials management; impact of technological economic and social change; significant related trends. Private- and public-sector policy implications. New and emerging analysis techniques. Prerequisite: BAd 280, 281, or permission of instructor.

391 **Seminar: Business Management** (3) Burdetsky
Examination of major current issues, both theoretical and empirical, affecting the development of the business enterprise. Topics to be announced. Empha-

sis on policy and strategic issues affecting the total enterprise. (Offered as the demand warrants) Staff

398 **Advanced Reading and Research** (arr.) Staff
Limited to doctoral candidates preparing for the general examination. May be repeated for credit.

399 **Dissertation Research** (arr.) Staff
Limited to doctoral candidates. May be repeated for credit.

## CARTOGRAPHY

See **Geography and Regional Science.**

## CHEMICAL TOXICOLOGY

See **Forensic Sciences** and **Chemistry.**

## CHEMISTRY

*Professors* T.P. Perros, W.E. Schmidt, D.G. White, J.B. Levy, N. Filipescu, E.A. Caress, D.A. Rowley, D. Ramaker *(Chair)*, M. King
*Associate Professors* A. Montaser, K.C. Adiga *(Research)*, H. Sambo *(Research)*, J.H. Miller
*Associate Professorial Lecturer* S.M. Barkin
*Assistant Professors* D. DiLella, M.A. Bobrik *(Visiting)*

*Bachelor of Arts or Bachelor of Science with a major in chemistry (departmental).* The department offers two undergraduate majors, both designed to give students a broad background in the basic divisions of chemistry: analytical, inorganic, organic, and physical. Major I, while providing considerable concentration in chemistry, permits a wider selection of electives. It thus should meet the needs of students preparing to enter medicine, dentistry, or related fields. Major II is intended primarily for students preparing for graduate study in chemistry or those planning to enter the chemical profession and wishing to be certified to the American Chemical Society as having met the minimum requirements for professional training. One foreign language (Russian, Japanese, German, or French) is recommended for students planning to do graduate work in chemistry.

The following requirements must be fulfilled:

1. Students in either Major I or Major II must meet the general requirements stated under Columbian College of Arts and Sciences.

2. Prerequisite courses for the Bachelor of Arts degree for Major I and Major II—Chem 11–12 and 22, or 15–16; required courses in related fields—Math 31, Phys 21–22. Bachelor of Science degree candidates must also take BiSc 11–12 or a year of other approved course work in the natural sciences or mathematics.

3. (a) Required courses for Major I—Chem 111–12, 113, 122, 134 or 235, 141, 151–52, and 153–54.

(b) Required courses for Major II—Chem 111–12, 113, 122, 123, 141–42, 151–52, 153–54, 235; one approved advanced course in chemistry or a related field. Required courses in related fields for Major II—Math 32 and a course in a structured computer programming language, such as Stat 129 or CSci 51.

For graduation with Special Honors in chemistry, a student must register for Chem 195 at the beginning of the senior year. The decision to award Special Honors will be based on competence in research and general achievement in chemistry, as evaluated by the faculty.

An entering student who is considering chemistry as a major is strongly encouraged to consult the Chemistry Department advisor regarding the program of study for the first two years. In general, the following sequence of courses is recommended for those students considering Major II: first year—Chem 11–12, Math 31 and 32 (or 30 and 31 if necessary), English composition, electives; second year—Chem 22, 151–52, and 153–54, Phys 21–22, Math 32 if not taken in first year, electives; third year—Chem 111–12, 113,

and 141, computer programming, electives; fourth year—Chem 122, 123, 235, 142, one advanced course in chemistry or a related field, electives. Major I students should follow this sequence in general and are urged to consult with the chemistry and premedical advisors concerning their academic programs.

*Bachelor of Science/Master of Science in the field of chemical toxicology*—This is a five-year program leading to the B.S. in the field of chemistry and M.S. in the field of chemical toxicology. The first three years of the program consist of undergraduate course work. Application for admission to the M.S. program in chemical toxicology will be made to the Graduate School of Arts and Sciences during the second semester of the third year; for admission to the graduate portion of the program, acceptance must be obtained prior to the start of the fourth year of the program. If acceptance into the M.S. program in chemical toxicology is not desired or not obtained, the requirements for the B.S./B.A. in chemistry, either Major I or II, may be fulfilled by the successful completion of appropriate courses during the fourth year of study. If acceptance into the M.S. program in chemical toxicology is obtained, the B.S. in chemistry will be awarded after the successful completion of the fourth year of the program.

The following requirements must be fulfilled:

1. Students must meet the general requirements stated under Columbian College of Arts and Sciences and the Graduate School of Arts and Sciences.

2. Course Requirements: Chem 11–12, 22, 111–12, 113, 122, 123, 141–42, 151–52, 153–54, 235; Phys 21–22; BiSc 11–12; Math 31, 32; Stat 127 and a course in a structured computer programming language; Phar 203; Bioc 221–22; Phyl 191; ForS 240, 245, and 242 or 270; either ForS or Chem 299–300; and two courses chosen from ForS 246, 248, 249, 269.

*Minor in Chemistry*—Required: Chem 11–12, 22, 50, and 110 or 111; Chem 151–52 and 153–54 may be substituted for Chem 50.

*Master of Science in the field of chemistry*—Prerequisite: a bachelor's degree with a major in chemistry from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Course work must include Chem 213 and 221 and at least two of the following: Chem 207, 236, and 251. Proficiency in computer programming must be demonstrated. Candidates are required to pass a Master's Comprehensive Examination.

Thesis option—30 semester hours of approved courses are required, including Chem 299–300, Thesis Research, which may be in analytical, inorganic, organic, or physical chemistry.

Nonthesis option—36 semester hours of approved courses are required, including Chem 298. Up to 9 semester hours in other departments relevant to the student's area of interest may be included in the program, subject to the approval of the Department of Chemistry. Students who are or will be employed in organizations dealing with science, technology, and public policy programs may wish to select from the following courses: BSc 203, 217, 222, 223, 252; PAd 260, 261; Mgt 233, 234.

*Master of Science in the field of geochemistry (an interdepartmental degree offered by the Departments of Chemistry and Geology)*—Prerequisite: a bachelor's degree with a major in chemistry or geology from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Chem 111–12, 213, and 299–300, and Geol 141, 241, and 249. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. Stat 129 or an equivalent course approved by the Department of Chemistry or Geology must be passed prior to beginning the third semester of graduate work or before beginning the thesis work, whichever occurs first.

*Doctor of Philosophy in the field of chemistry*—Required: the general requirements stated under the Graduate School of Arts and Sciences. Chem 207, 213, 221, 235, 251, and 350 are normally required of the doctoral student, in addition to other courses and requirements as determined by consultation with the departmental program committee. Proficiency in computer programming must be demonstrated. Cumulative examinations replace the General Examination requirement.

*Research fields:* analytical and molecular spectroscopy, chemical instrumentation, combustion chemistry, chemical toxicology, fluorine chemistry, forensic chemistry, geochemistry, organic synthesis/natural products, photochemistry, structure/reactivity studies, surface science, theoretical chemistry, trace analysis, transition metal complexes.

Ph.D. students in chemistry may substitute up to 12 hours of Dissertation Research (Chem 399) in the form of course work jointly approved by the Chemistry Department and the Graduate Program in Science, Technology, and Public Policy. The purpose of this option is to provide a useful background for chemistry doctoral students who may be employed in government agencies dealing with science, technology, and public policy programs. The 12 hours may be selected from the following courses: PSc 203, 217, 222, 223, 252; PAd 260, 261; Mgt 233, 234.

*Doctor of Philosophy in the field of geochemistry (an interdepartmental degree offered by the Departments of Chemistry and Geology)*—Required: the general requirements stated under the Graduate School of Arts and Sciences, including Stat 129 and either Stat 118 and 119, or 91, and the satisfactory completion of the General Examinations in four fields, including chemistry and geochemistry.

**Graduate Placement Examinations:** All entering students in the master's and doctoral programs in the field of chemistry are required to take the American Chemical Society Graduate Level Placement Examinations, given by the Department of Chemistry, prior to registration in the Graduate School of Arts and Sciences. The four placement examinations (in the disciplines of analytical, organic, inorganic, and physical chemistry) are of the multiple-choice type. These tests are designed to cover the subject matter in the disciplines generally taught in modern undergraduate programs preparatory for graduate work in chemistry, and the results are used by the department to advise the individual student in planning a program of courses appropriate to the student's background.

All graduate students are required to participate in the seminar and colloquium programs.

**Registration:** Before completing registration each student must obtain from the representative of the department an assignment to lecture, recitation, and laboratory sections. Upon consultation with course instructors, specific prerequisites may be waived for the particular courses.

## PHYSICAL SCIENCE

### First Group

3–4 **Contemporary Science for Nonscience Majors** (3–3) Filipescu
Lecture (2 hours), laboratory (3 hours). Contemporary topics in physical, biological, and medical science. Chem 3 is not prerequisite to Chem 4. Laboratory fee, $20 per semester. (Academic year)

## CHEMISTRY

### First Group

11–12 **General Chemistry** (4–4) Perros, Rowley, White
Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure and properties; stoichiometry; gas, liquid, and solid state; chemical bonding; solutions; chemical kinetics and equilibria; thermodynamics; acids and bases; electrochemistry; introduction to descriptive chemistry. Prerequisite to Chem 11: one year of high school algebra. Prerequisite to Chem 12: Chem 11. Laboratory fee, $35 per semester. (Chem 11 and 12—fall and spring) Staff

13 **General Chemistry** (4)
For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure; chemical bonding; chemical equations; acids and bases; chemical equilibrium; liquid and solid states; periodicity; electrochemistry. Prerequisite or concurrent registration

Math 31, Phys 14. Laboratory fee, $35. After completion of Chem 13, Chem 11–12 may not be taken for credit. (Fall and spring)

15–16 **Intensive General and Analytical Chemistry** (4–4) Staff
(Honors Course)
Chem 15: Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Chem 16: Lecture (2 hours), laboratory (6 hours), recitation (1 hour). Equivalent to Chem 11–12 and 22, but with selected topics studied in depth. Prerequisite to Chem 15: high school physics and chemistry. Prerequisite to Chem 16: Chem 15. Admission by placement test prior to registration or on basis of College Board Advanced Placement Examination. Laboratory fee, $35 per semester. (Academic year)

22 **Introductory Quantitative Analysis** (3) Schmidt
Theory and practice of quantitative analysis by modern methods; evaluation of analytic data emphasizing detection and correction of experimental errors. Correlated with Chem 23. Prerequisite: Chem 12, 13, or 16. (Fall and spring)

23 **Introductory Quantitative Analysis Laboratory** (2) Schmidt and Staff
Laboratory complement to Chem 22. Prerequisite or concurrent registration: Chem 22. Laboratory fee, $35. (Fall and spring)

50 **Introduction to Organic Chemistry** (4) Caress
Lecture (3 hours), laboratory (3 hours). A terminal course for students in other disciplines. This course does not fulfill the organic chemistry requirement for chemistry majors or premedical students. Credit may not be earned for both Chem 50 and Chem 151–52. Prerequisite: Chem 12 or 16. Laboratory fee, $35. (Spring)

**Second Group**

105 **Environmental Chemistry** (3) Miller
Chemistry and physics of the environment, with emphasis on water and air pollution. Environmental analysis and modeling and their limitations. (Fall)

110 **Introduction to Physical Chemistry** (3) Ramaker
Gas, solid, and liquid state, chemical thermodynamics, solutions, chemical equilibrium, kinetics, quantum chemistry, spectroscopy, and macromolecules. Prerequisite: Chem 16 or 22; Math 31; Phys 2 or 22; or permission of instructor. Not open to chemistry majors. May not be taken for credit by students who have received credit for Chem 111–12 or an equivalent course.

111–12 **Physical Chemistry** (3–3) Miller, Ramaker
Gas laws, chemical thermodynamics, chemical equilibrium, kinetics, quantum chemistry, atomic and molecular spectra, structure of solids, liquids, and macromolecules. Prerequisite to Chem 111: Chem 16 or 22; Math 31; Phys 21, 22; or permission of instructor. Prerequisite to Chem 112: Chem 111. (Academic year)

113 **Physical Chemistry Laboratory** (2) Miller, DiLella
Laboratory complement to Chem 111. Prerequisite or concurrent registration: Chem 111. Laboratory fee, $35. (Spring)

122 **Instrumental Analytical Chemistry** (3) Montaser
Theory of instrumental methods in qualitative and quantitative analysis, determination of structure, with emphasis on electroanalysis, atomic and molecular spectrophotometry, mass spectrometry, and chromatography. Correlated with Chem 123. Prerequisite or concurrent registration: Chem 111 or permission of instructor. (Fall)

123 **Instrumental Analytical Chemistry Laboratory** (2) DiLella
Laboratory complement to Chem 122. Prerequisite or concurrent registration: Chem 111 and 122. Laboratory fee, $35. (Fall)

134 **Descriptive Inorganic Chemistry** (2) Rowley
Intermediate-level course emphasizing the descriptive chemistry of the elements. Prerequisite: Chem 16 or 22, 152. (Spring)

**141–42 Advanced Experimental Chemistry** (3–2) White, Caress, King
Chem 141: Experimental methods common to all disciplines of chemistry, use of the chemical literature, interpretation of spectra by correlation methods, and operation of basic chromatographic and spectroscopic instrumentation. Chem 142: Advanced organic and inorganic laboratory techniques. Emphasis on individual work and on sophisticated methods for the separation, characterization, and identification of compounds. Prerequisite: Chem 154. Prerequisite or concurrent registration: Chem 111 or permission of instructor. Laboratory fee, $35 per semester. (Academic year)

**151–52 Organic Chemistry** (3–3) Levy, King
Introductory course for science majors and others preparing for related graduate work. Systematic treatment of the structure, preparation, properties, and reactions of the principal classes of organic compounds. Fundamental principles of stereochemistry, reaction mechanisms, and spectroscopic methods of analysis are included. Credit may not be earned for both Chem 50 and Chem 151–52. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)

**153–54 Organic Chemistry Laboratory** (1–1) Staff
Laboratory complement of Chem 151–52. Introduction to and practice in basic skills of synthesis, separation, and purification of organic compounds. Prerequisite or concurrent registration: Chem 151–52. Prerequisite to Chem 154: Chem 153. Laboratory fee, $35 per semester. (Academic year)

**156 Qualitative Organic Analysis** (3) King
Lecture (1 hour), laboratory (6 hours). Separation of mixtures such as essential oils, peptides, commercial pharmaceuticals, carbohydrates, and/or others as appropriate; identification of their components using spectroscopic techniques. Lecture emphasizes the practical considerations in separation methods (including GLPC, TLC, and HPLC) and the spectral interpretation of unknown substances. Prerequisite: Chem 16 or 22, 154. Laboratory fee, $35. (Spring, odd years)

**191 History of Chemistry** (2 or 3) Perros
Historical development of chemistry from antiquity to the 20th century. Prerequisite: Chem 12. (Spring)

**193 Chemical Instrumentation** (3) Montaser
Lecture (2 hours), laboratory (3 hours). Electronic analog measurements and control of electrical quantities in chemical instrumentation; digital and analog data conversion and optimization of electronic measurements in chemical instrumentation. Prerequisite: Chem 112 and 123 or permission of instructor. Laboratory fee, $10. (Fall)

**195 Undergraduate Research** (1 or 2) Staff
Research on problems approved by the staff. Approval must be obtained prior to registration. May be repeated once for credit. Laboratory fee, $35 per semester hour. (Fall and spring)

## Third Group

**207 Chemical Bonding** (3) Ramaker
Quantum mechanics, approximate methods, electron spin, Pauli principle, atomic and molecular structure. Prerequisite: Chem 112. (Fall)

**211–12 Physical Chemistry** (2–1) Miller, Ramaker
Same as Chem 111–12. Admission only by departmental permission. Credit assigned upon satisfactory completion of Chem 213. (Academic year)

**213 Chemical Thermodynamics** (3) Miller
Application of thermodynamics to chemical problems. Emphasis on statistical calculation of thermodynamic properties. Prerequisite: Chem 112 or 212. (Spring)

**218 Molecular Spectroscopy** (3) DiLella
Applications of quantum chemistry, molecular orbital theory, valence bond

theory, vibration and rotation of molecules, IR and electronic spectroscopy. Prerequisite: Chem 207. (Spring, odd years)

221 **Advanced Analytical Chemistry I** (3) Montaser
Theory and application of recent spectrometric methods of analysis, including electrical, magnetic, and optical instrumentation, X-ray methods, and surface analysis techniques. Prerequisite: Chem 122. (Fall)

222 **Advanced Analytical Chemistry II** (3) Schmidt
Theory and application of electroanalysis and separations by physiochemical methods. Prerequisite: Chem 122. (Spring, even years)

233 **Organometallic Chemistry** (3) White
Survey of organometallic compounds, with emphasis on the compounds of lithium, boron, aluminum, silicon, and the transition metals and the catalytic role of certain organotransition metal complexes. Prerequisite: Chem 235 and 251, or permission of instructor. (Spring, even years)

235–36 **Advanced Inorganic Chemistry** (3–3) Staff
Application of modern chemical theories to inorganic substances and reactions followed by a detailed study, developed from the periodic table, of the chemistry of the more common elements. Prerequisite to Chem 235: Chem 112, 152. Prerequisite to Chem 236: Chem 235. (Academic year)

251–52 **Advanced Organic Chemistry** (3–3) Filipescu
Synthesis, reactions, and properties of organic compounds; fundamental theories of organic chemistry, emphasis on reaction mechanisms. Prerequisite to Chem 251: Chem 112, 152. Prerequisite to Chem 252: Chem 251. (Academic year)

257 **Physical–Organic Chemistry** (3) Levy
The transition state theory of chemical kinetics, applications to reaction mechanisms; kinetic isotope effects, linear-free energy relationships, concentrated and "super" acids, Woodward–Hoffman rules, free radical reactions. Prerequisite: Chem 252 or permission of instructor. (Fall, odd years)

258 **Synthesis and Structure Determination in Organic Chemistry** (3) Staff
Spectroscopic methods of structure determination; the design of synthesis for complex organic molecules; survey of modern synthetic methods, including asymetric induction. Prerequisite: Chem 251 or permission of instructor. (Fall, even years)

259 **Polymer Chemistry** (3) Barkin
A study of the preparation, properties, and structure of macromolecules. Prerequisite: Chemistry 152 and 110 or 111 or permission of instructor. (Fall)

295 **Research** (arr.) Staff
Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit not to exceed a total of 8 semester hours. Laboratory fee, $35 per semester hour. (Fall and spring)

298 **Independent Study** (3) Staff
Limited to master's degree candidates. A survey of a topic approved by departmental staff and resulting in a written report.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

**Fourth Group**

350 **Choice and Design of a Research Problem** (1) Staff
Development in written form of an original research plan, fully referenced, and its oral defense. If a grade of C is received, the student must repeat this course for credit and must develop a new research plan. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy cumulative examinations. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## CHINESE

See **East Asian Languages and Literatures.**

## CLASSICS

*Associate Professors* J.E. Ziolkowski *(Chair)*, E.A. Fisher
*Assistant Professor* M.D. Ticktin
*Assistant Professorial Lecturer* D.B. Beers
*Instructor* Y.M. Moses

*Bachelor of Arts with a major in classical humanities (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Clas 1–2, 3, 4; or equivalent; or Clas 11–12, 13–14; or equivalent; and Clas 71, 72.
3. Required courses in the major—(a) 12 semester hours selected from second-group classics courses; (b) 18 semester hours selected from Art 101, 102, 103, 112, 155; Hist 105, 107, 108, 109, 110, 111, 209; Phil 111; PSc 105; Rel 143.

*Bachelor of Arts with a major in classical archaeology and classics (departmental)*—An interdepartmental major arranged in conjunction with the Department of Art. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Clas 1–2, 3, 4; or Clas 11–12, 13–14.
3. Required courses in the major—Art 101, 102, 112, 155; three courses selected from Hist 107, 108, 109, 110, 209; 6 semester hours in second-group courses in Greek or Latin. (A reading knowledge of French and German is recommended.)

*Minor in classical humanities*—(a) 6 semester hours selected from Clas 1–2 or 11–12; (b) 9 semester hours selected from Clas 3, 4, 13, 14, 71, 72, 105, 106, 113, 127, 134, 170, 185, 186; (c) 6 semester hours selected from Art 101, 102, 103, 111; Hist 107, 108, 109, 110.

### COURSES IN GREEK, HEBREW, LATIN, AND YIDDISH

**First Group**

**1–2 Beginning Latin (3–3)** Ziolkowski
Grammatical essentials of Latin, appropriate reading selections, development of English derivatives, introduction to Roman life and literature. (Academic year)

**3 Intermediate Latin: Prose and Poetry (3)** Staff
Development of ability to read and understand Latin literature of moderate difficulty. Prerequisite: Clas 1–2 or equivalent. (Fall)

**4 Vergil's *Aeneid* (3)** Staff
Significant passages of Vergil's famous epic—in Latin; reading and discussion of the entire poem in translation. Prerequisite: Clas 3 or permission of instructor. (Spring)

**11–12 Beginning Greek: Classical (3–3)** Fisher
Study of the grammar, vocabulary, and structure of ancient Greek. Reading of selected ancient authors. (Alternate academic years)

**13–14 Intermediate Greek: Classical (3–3)** Fisher
Reading of ancient Greek prose or poetic works (e.g., selections from Homer, Plato, Euripides). Review of grammar. Prerequisite: Clas 11–12 or equivalent. (Alternate academic years)

**21–22 Beginning Hebrew (4–4)** Moses
An active presentation of Hebrew as it is spoken and written today. Comprehension, speaking, reading, and writing skills are stressed. Laboratory fee, $35 per semester. (Academic year)

23–24 **Intermediate Hebrew** (3–3) Ticktin
Further development of skills in speaking, reading, writing, and comprehension of modern Hebrew. Texts range from Israeli newspaper items to selections from classical materials. Prerequisite: Clas 21–22 or equivalent. Laboratory fee, $35 per semester. (Academic year)

25–26 **Yiddish for Reading and Conversation** (3–3) Ticktin
Grammatical essentials of the language, appropriate reading selections, conversational exercises for beginners. (Alternate academic years)

**Second Group**

103 **Modern Hebrew Nonfiction** (3) Ticktin
Directed readings in humanities and social sciences. Development of linguistic skills necessary for independent research. May be repeated for credit. (Fall)

104 **Modern Hebrew Fiction** (3) Ticktin
Study of selected modern Israeli short stories and poems. May be repeated for credit. (Spring)

109–10 **Major Latin Authors** (3–3) Ziolkowski
Selections from one or two major authors will be read each semester. May be repeated for credit. Prerequisite: Clas 3, 4; or permission of instructor. (Academic year)

139–40 **Major Greek Authors** (3–3) Staff
Selections from a wide variety of Greek prose, drama, and poetry, suited to the needs of the class. May be repeated for credit with permission of instructor. Prerequisite: Clas 14. (Academic year)

185–86 **Directed Reading** (1, 2, or 3) Staff
Advanced reading in Greek, Hebrew, or Latin. Admission by permission of instructor. May be taken for graduate credit.

## COURSES IN ENGLISH TRANSLATION

**First Group**

63 **Greek and Latin Origins of Medical Terms** (3) Staff
Mastery of medical terminology by learning word elements from Greek and Latin and the principles that govern both the formation of medical words and the derivation of their meanings. (Fall)

64 **Greek and Latin Origins of English Words** (3) Staff
Study of Greek and Latin elements in English to improve vocabulary and facilitate understanding of the language of science, philosophy, politics, etc. (Spring)

71 **Greek Literature and Civilization** (3) Ziolkowski
Study of ancient Greek civilization with focus on public and private life as seen primarily through literature. (Fall)

72 **Roman Literature and Civilization** (3) Ziolkowski
Study of Roman civilization with focus on public and private life as seen primarily through literature. (Spring)

100 **Modern Hebrew Literary Classics** (3) Ticktin
Prose and poetry of a century of writing from the beginning of the Hebrew literary renaissance to contemporary Israeli literature, including works of Bialik, Agnon, Hazaz, Amichai, Oz, and Yehoshua. Discussions stress historical development and authors' treatments of tradition and modernity.

**Second Group**

101 **Israeli Society and Culture: Literary Perspectives** (3) Ticktin
A study of literature reflecting such contemporary issues as the conflict between the "builders' generation" and their children; the cultural contacts of Ashkenazim and Sefardim; image of the Arab; impact of the Holocaust; Zionist ideals and current realities. (Fall)

102 **Contemporary Israeli Short Stories and Poetry** (3) Ticktin
An introduction to post-1948 writers, including A.B. Yehoshua, Amos Oz, David Shahar, Aharon Apfelfeld, Dahlia Ravikovitch, Yehuda Amichai, Haim Gury, Amir Gilboa, and Amalia Kahana-Karmon. (Spring)

105 **Special Topics** (3) Staff
Topics in Greek, Hebrew, Roman, and Yiddish literature; topics announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

108 **Greek and Roman Mythology** (3) Fisher
The creation of the world, the nature of the gods, and the adventures of heroes as described in various Greek and Roman literary sources (e.g., epic, drama, hymns) and as shown in ancient art. Introduction to various theories about the nature and function of mythology (e.g., Jung, Levi-Strauss). (Fall)

113 **Greek and Roman Drama** (3) Staff
Study of Greek and Roman tragedy and comedy; the nature and setting of dramatic performance in classical antiquity. (Spring)

127 **Classical Influence on Western Civilization** (3) Ziolkowski
A survey of Greek and Roman influence on Western civilization, especially in architecture, language, literature, and science. Prerequisite: a course in classical literature or history.

170 **Women in Classical Antiquity** (3) Staff
In-depth study and discussion of readings from ancient and modern sources on the role of women in Greek and Roman society.

## COMMUNICATION*

*Professors* W.M. Reynolds, C.H. Sterling
*Associate Professors* J.E. Thiel, R.S. Fortner *(Chair)*
*Assistant Professors* S. Keller, M.A. Tolstedt, D.A. Durham
*Adjunct Assistant Professors* E. Ashton, M.M. Travis
*Instructor* E.M. Murray

*Bachelor of Arts with a major in radio–television (departmental)*†—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences
2. Required courses in related areas—18 semester hours in a single subject area outside the Communication Department as approved by the major advisor.
3. Required courses in the major—Comm 1, 55, 75, 133, 134, 145, 199. Eighteen hours of second-group radio–television or film courses as approved by the major advisor. Nine of these hours must be in the 180–189 sequence.

*Bachelor of Arts with a major in speech communication (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences
2. Prerequisite courses—Comm 1; SpHr 11.
3. Required courses in related areas—12 semester hours in psychology and/or philosophy as approved by the major advisor; 18 semester hours in a single subject area outside the Department of Communication as approved by the major advisor (the 12 hours in psychology or philosophy will partially fulfill the subject-area requirement).
4. Required courses in the major—Comm 112, 121, 126; 15 additional semester hours of second-group courses in the Communication Department as approved by the major advisor.

*Minor in speech communication*—18 semester hours of communication courses including Comm 1, 112, 121, and 126; SpHr 11.

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* Courses and programs in the Communication Department may be revised significantly in 1988. Further information will be provided as soon as it is available
† Admission to this major may be on a selective or space-available basis.

**First Group**

1 **Speech Communication** (3) Keller and Staff
The study and practice of the basic principles and techniques of public speaking used to inform and persuade audiences. Emphasis on the speech building process: research, composition, organization, style, delivery, and criticism. Laboratory fee, $5. (Fall and spring)

2 **Interpersonal Communication** (3) Staff
Study of the role of verbal and nonverbal communication in spontaneous, face-to-face encounters and interviews. Role playing, models, and simulations. (Fall and summer)

30 **Television's View of America** (3) Staff
The role of television entertainment and news programming in portraying the American people and interpreting their values and aspirations, their faults and frailties, their successes and failures, their heroes and villains. (Summer)

49 **Rhetoric in Political and Social Action** (3) Keller
Study of the use and abuse of rhetoric in contemporary political and social movements. Theories of persuasion and agitation, as well as means of support considered in various case studies including civil rights and antiwar protests. (Fall)

55 **Introduction to Electronic Mass Media** (3) Sterling
Introduction to theory, forms, content, research, and societal role of American broadcasting and newer media as a process in communication. The course provides a context for studies in journalism, management, sociology, political science, and economics. (Fall and spring)

75 **Sight and Sound** (3) Thiel
Development of a critical awareness of aural and visual communication through an introduction to the aesthetics, techniques, and organization of the creative process in electronic media. Lecture (2½ hours), laboratory (2 hours). Prerequisite: permission of instructor for nonmajors. Laboratory fee, $10. (Fall and spring)

100 **Communication Theory** (3) Staff
Study of the various theoretical approaches that may explain the role of communication in society and its impact and practice. Examination of theories of rhetoric, communication, and mass communication, along with the biases, assumptions, and research methodologies of each approach. (Fall and spring)

**Second Group**

111 **Business and Professional Speaking** (3) Reynolds and Staff
Study of the communication process in business and professional organizations; practice in interviewing, small group communication, and speeches for special occasions. Primarily for nonmajors. (Fall and spring)

112 **Persuasion** (3) Keller
In-depth study of the principles and techniques of persuasion, focusing on theory and practice. Emphasis is placed on the common-premise model while considering factors of image, support materials, emotion, audience analysis, and style. Prerequisite: Comm 1 or permission of instructor. (Spring)

121 **Small Group Communication** (3) Staff
The study and practice of communication in small groups focusing on problem solving, norms, roles, and leadership. Prerequisite: Comm 1 or permission of instructor. (Fall and spring)

126 **Argumentation and Debate** (3) Reynolds
Study of the advocacy process, with emphasis on issue identification, use of evidence, and logical proof. Practice in oral advocacy and argumentative speaking. Prerequisite: Comm 1 or permission of instructor. (Fall)

127–28 **Forensic Practice** (1–1) Keller
Student participation in intercollegiate speech activities. May be repeated for

a total of 4 semester hours of credit. Admission by permission of instructor. (Fall and spring) Staff

129 **TV News: The Politics of Visibility** (3)
Same as Jour/PSc 129. Thiel

132 **Radio–Television Performance** (3)
Introduction to the basic theories and techniques required for effective, non-dramatic media performance (i.e., announcing, moderating, newscasting, etc.). Prerequisite: Comm 1 or 110. (Spring and summer) Fortner

133 **Development of American Electronic Media** (3)
Study of the origins, structure, and nature of American broadcasting and related media. Prerequisite: Comm 55. (Spring) Tolstedt

134 **Audio Production** (3)
Introduction to the basic concepts of radio as a communication medium; emphasis on the design and production technique of a variety of audio programs. Lecture (2½ hours), laboratory (2 hours). Prerequisite: Comm 75 (for radio–television majors) or permission of instructor. Laboratory fee, $10 (Fall and spring) Tolstedt

137 **Scriptwriting** (3)
Study and practice of the forms, techniques, and types of writing for radio, television, and film. Prerequisite: Engl 11 or 12, and Comm 75 (for radio–television majors) or permission of instructor. (Fall) Staff

138 **Scriptwriting: Selected Topics** (3)
Intensive study and practice of a specific genre of radio, television, and film writing. Topics may include adapting the literary text, series and serials, and anthology drama. Prerequisite: Engl 11 or 12, and Comm 75 (for radio–television majors) or permission of instructor. (Spring, even years) Keller

141 **Negotiations and Conflict Resolution** (3)
Communications factors involved in negotiation and conflict resolution. Use of models and simulations to explore prominent-solution approach to conflict situations. (Summer) Staff

142 **Topics in Electronic Media** (1 to 3)
An in-depth study of specific topics and/or controversial issues. (Summer) Reynolds

143 **Origins of Contemporary Rhetorical Theory** (3)
Study of rhetorical theory and method as they evolved in the Western world from the classical period to the present. (Fall, even years) Reynolds

144 **History and Criticism of American Public Address** (3)
Study of American oratory from its pre-Revolution origins to the present day, interpreted in terms of issues and movements. (Spring, odd years) Staff

145 **Introduction to Television Production** (3)
Basic course in television production techniques and skills. Directing, scriptwriting, graphics, and other aspects of television production. Extensive practice in working television equipment, emphasis on various in-studio projects. Lecture (2 hours), laboratory (2½ hours). Prerequisite: Comm 134. Laboratory fee, $10. (Fall) Thiel

146 **Television Directing** (3)
Advanced study and practice of television directing techniques. Students are expected to demonstrate skill in working with studio and electronic field production equipment and in the development of television programs from original concepts to final productions. Lecture (2 hours), laboratory (3 hours). Prerequisite: Comm 145 and permission of instructor. Laboratory fee, $10 (Spring) Staff

148 **Program Design and Development** (3)
Close examination of the role of the producer in the television industry. Emphasis on both the creative and executive decision-making aspects of producing. Prerequisite: Comm 145 or permission of instructor. (Spring) Fortner

171 **Language of Cinema** (3)
Introduction to cinema as language through analysis of the components of film structure—camera, editing, sound, movement, music, dialogue, and mise-en-scene. Laboratory fee, $25. (Fall)

172 **Film Directors and Styles** (3) Staff
Examination of influence on major film directors of twentieth-century art movements: German expressionism, Soviet constructivism, surrealism, neo-realism, and structuralism. Comparison of film narrative with styles in dramatic and visual art forms. Laboratory fee, $25. Prerequisite: Comm 173. (Fall)

173 **History of Cinema** (3) Staff
An examination of the history, structure, and theory of motion pictures in America and abroad. Same as Art 173. Laboratory fee, $25. (Fall)

174 **Special Studies in Film** (3) Staff
In-depth study of specific film topics. Laboratory fee, $25. Prerequisite: Comm 173. (Spring)

175 **The Political Image** (3) Staff
An analysis of the techniques of propaganda and rhetoric used in film and television to visualize political ideology. Laboratory fee, $25. (Spring, even years)

176 **Film as Fact and Fiction** (3) Travis
A comparison of structural differences between documentary and fiction film in order to study how each presents different versions of reality. Laboratory fee, $25. (Spring, odd years)

180 **Regulation and Policy in Electronic Media** (3) Sterling
Legal, technical, political, economic, and social aspects of radio, television, and cable and related delivery systems. Structure and operation of FCC and other agencies, plus role of Congress and courts. Consideration of problems in spectrum allocation, behavioral regulation, the trend to deregulate political influence, and current policy matters. Prerequisite: Comm 55 or 133. (Fall)

181 **Inside Television: Corporate Strategy and Management** (3) Staff
Seminar on the operations and decision-making activities of the television industry: networks, affiliates, independent stations, public television, and cable/satellite organizations. Topics include programming, sales, representation, promotion, ratings, and legal constraints. Prerequisite: Comm 55 or 133. (Spring)

182 **Innovation in Electronic Media** (3) Durham
Examination of current and future trends in electronic media, with emphasis on radio, television, and cable, including developments in technology, programming, industry structure, and public policy. Prerequisite: Comm 55 or 133. (Fall)

184 **International Communication** (3) Fortner
Examination of the historical and present communication activities of major international news-gathering and broadcasting organizations, international communications policy forums, organizations and treaties, spectrum allocation criteria, communications technology, programming development, and trade. The role of international propaganda as a policy tool; the current debate over a "New World Information order." (Spring, even years)

185 **Comparative Communication Systems** (3) Fortner
In-depth study of the developmental, regulatory, political, economic, and cultural dimensions of selected foreign communication systems; emphasis on broadcasting, cable, and satellite applications. Prerequisite: Comm 55 or 133. (Spring)

189 **Effects of Electronic Media** (3) Durham
Current concepts of the impact of broadcasting and related media on audiences, social science research findings and methods, including persuasion, formation of opinion, media and personal interaction, violence, audience characteristics and media use patterns, and development of related theories and models of mass communication. Prerequisite: Comm 55 or 133. (Spring)

196 **Independent Study** (1 to 6) Staff
Independent research and special projects. Open to seniors or exceptionally

well-prepared juniors majoring in speech communication. Before students are permitted to register for Comm 196, they must submit a written proposal of the plan of study and obtain approval of the staff member who will be directing the study and of the department chairman. Thiel

197 **Internship: Radio and Television** (3)
Open to seniors majoring in radio–television. Students will spend at least 16 hours a week during the semester in an approved media position with local nonprofit, corporate, or commercial organizations. Seminar meetings, reports, and career-oriented projects. Admission requires departmental approval. May be repeated once for credit. (Fall and spring)

199 **Senior Seminar: Radio and Television** (3) Fortner, Durham
Capstone course providing a survey and integration of the major viewpoints and concepts of radio and television. Reading, research, and class discussions on selected topics. Under the guidance of an instructor, the student writes a major research paper on an approved topic. Limited to radio–television majors. Prerequisite: all radio–television required courses or permission of instructor and the major advisor. (Fall)

## COMPUTER AND INFORMATION SYSTEMS

See **Statistics/Computer and Information Systems.**

## CRIME IN COMMERCE

See **Forensic Sciences.**

## CRIMINAL JUSTICE

See **Sociology** for the Bachelor of Arts with a major in criminal justice.
See **Forensic Sciences** for the Master of Arts in the field of criminal justice.

## DANCE

See **Theatre and Dance.**

## DRAMA

See **Theatre and Dance.**

## EARLY MODERN EUROPEAN STUDIES

**Committee on Early Modern European Studies**
R.E. Kennedy, Jr. *(Chair)*, I. Azar, C.A. Linden, J.A. Quitslund, L.F. Robinson, R.H. Schlagel, K. Thoenelt, D. Wallace

The Columbian College of Arts and Sciences offers an interdisciplinary program in Early Modern European Studies. This humanities program is designed to enhance the student's understanding of the history, philosophy, religion, science, literature, and art of the five centuries (1300–1800) during which the Western world began to take on its modern dimensions. The program is directed by an interdepartmental committee.

*Bachelor of Arts with a major in Early Modern European Studies* – The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Requirements for the major:
   a. The core interdisciplinary course Individualism, Reason, and Tradition in Early Modern Europe (Hist/Engl/Fren/Ger/Rel 183, and Art 187).
   b. Six semester hours of second-group French, German, or Spanish literature courses taught in the language, from among the following: Fren 120, 121–22, 123–24; Ger 103–4, 111–12, 131–32; Span 121–22, 123–24, 125.

c. Phil 112; Rel 145; PSc 106.
d. Twenty-seven semester hours of art history, history, and English literature, with the course distribution to be determined in consultation with the program advisor, and with a minimum of 6 hours from each of the following groups: Art 104–5, 106–7, 108, 113–14, 121–22; Engl 125–26, 127–28, 129, 130, 131–32; Hist 101, 105, 121–22, 123, 141, 148, 151, 153, 154.

## EAST ASIAN LANGUAGES AND LITERATURES

Professor C.W. Shih *(Chair)*
Associate Professors J. Chaves, D.L. Lee, Y.-K. Kim-Renaud
Associate Professorial Lecturer M.-J.C. Loh
Assistant Professor G.C.Y. Wang
Lecturers T. Kimura, L.Y.C. Jiordano, N.H. Kuo, H.F. Wagner

**Bachelor of Arts with a major in Chinese language and literature (field-of-study)**—The requirements are as follows:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Chin 5–6 (preferred); or Chin 1–2, 3–4, and 9; or Chin 7–8 and 9.
3. Required for the major—Chin 11–12, 109–10, and 163–64 or 181–82; plus 12 additional semester hours of second-group Chinese literature courses. The student is required to pass a major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199–200) assists the student in preparation for the major examination.

**Minor in Chinese language and literature**—Prerequisite: 18–22 credit hours, including either Chin 1–2, 3–4, and 11 or Chin 5–6 and 11. The minor consists of 12 additional credit hours selected from Chin 12, 107, 108, 109, 110, 123–24, 163–64, 179, 180, or 181–82.

### CHINESE

**First Group**

*1–2 **Beginning Mandarin Chinese, Part I** (3–3) Wang
Fundamentals of grammar and pronunciation, with graded reading and practice in writing. Laboratory fee, $35 per semester. (Academic year)

*3–4 **Beginning Mandarin Chinese, Part II** (3–3) Wang
Continuation of grammar and spoken Chinese, with more emphasis on the written language and reading. Laboratory fee, $35 per semester. (Academic year)

5–6 **Beginning Intensive Mandarin Chinese, Parts I–II (8–8)** Lee
Intensive beginner's course in fundamentals of grammar and pronunciation, with graded reading and practice in writing. Laboratory fee, $35 per semester. (Academic year)

*7–8 **Beginning Intensive Mandarin Chinese** (6–6) Lee, Wang
Intensive beginner's course in fundamentals of grammar and pronunciation, with graded reading and practice in writing. Laboratory fee, $35 per session. (Summer)

*9 **Beginning Mandarin Chinese, Part II** (4) Lee
Reading of simple modern expository writings. Analysis of syntactic structure and practice in writing. Prerequisite: Chin 4 or 8. Laboratory fee, $35. (Fall or spring)

* The combination of Chin 1–2, 3–4, and 9, or the combination of Chin 7–8 and 9, is equivalent to Chin 5–6.

10 **Chinese Calligraphy** (1) Loh
Design and writing of Chinese characters with traditional writing implements. No knowledge of the language required. May be repeated for credit. (Fall and spring)

11–12 **Intermediate Intensive Mandarin Chinese** (6–6) Wang
Reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Prerequisite to Chin 11: Chin 6 or 9. Laboratory fee, $35 per semester. (Academic year)

22 **Intermediate Chinese Conversation** (3)
A practical course for improving speaking ability. Prerequisite: 6 credit hours of Chinese or equivalent. May be repeated for credit.

91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
Same as IAff 91.

**Second Group**

107–8 **Readings in Modern Chinese** (3–3) Staff
Readings in selected modern literary works, social science materials, and documentary materials. Prerequisite: Chin 12 or equivalent. (Academic year)

109–10 **Introduction to Classical Chinese** (3–3) Shih, Chaves
Introduction to classical writings in Chinese literature, history, and philosophy. Prerequisite: Chin 6 or 9. (Alternate academic years)

123–24 **Introduction to Chinese Linguistics** (3–3) Lee
Introduction to the history of the Chinese language. Analysis of linguistic structure of modern spoken Chinese and classical Chinese. Prerequisite: Chin 6 or equivalent, or a course in linguistics. (Alternate academic years)

161–62 **Chinese Culture Through Films** (3–3) Shih
Survey of the Chinese cultural heritage presented through films. Topics include literature, philosophy, art, religion, and social history from prehistorical times to the modern era. Lectures and discussion in English.

163–64 **Chinese Literature in Translation** (3–3) Chaves
An introductory course focusing on major works of poetry, drama, and the novel in their historical and social context. (Academic year)

179–80 **20th-Century Chinese Literature** (3–3) Shih
Works of Lu Xun, Lao She, and others. Drama of Tian Han and Cao Yu. Prerequisite: Chin 107 or equivalent. (Alternate academic years)

181 **Literature in Traditional Chinese Society—in Translation** (3) Chaves
Introduction to the various roles played by literature in pre-modern China, as well as the reflection of society in traditional literature.

182 **Literature in the People's Republic of China—in Translation** (3) Chaves
Survey of stories, poems, and plays in the PRC and their role in political and social events.

185–86 **Directed Reading** (3–3) Staff
Reading of material in the student's field of interest. Admission by permission of instructor. (Academic year)

199–200 **Proseminar: Readings for the Major in Chinese Language and Literature** (3–3) Staff
Conferences and group discussions. (Academic year)

**Third Group**

271–72 **Poetry of the Tang and Song Periods** (3–3) Chaves
Reading of works of leading poets. Discussion of content and style. Prerequisite: Chin 109 or equivalent. (Alternate academic years)

273 **Yuan Drama** (3) Shih
Readings of plays by Guan Han-qing, Ma Zhi-yuan, and others. Prerequisite: Chin 109 or equivalent.

277–78 **Prose Narratives of the Song, Ming, and Qing Periods** (3–3) Shih
Short stories of the Song period. Selected readings of Ming/Qing novels

Historical development and stylistic traits. Prerequisite: Chin 107 or equivalent. (Alternate academic years)

299–300 **Thesis Research** (3–3)

## JAPANESE

### First Group

1–2 **Beginning Japanese, Part I** (4–4) Kimura, Kuo
Fundamentals of grammar and pronunciation, with graded reading and practice in writing. Laboratory fee, $35 per semester. (Academic year)

3–4 **Beginning Japanese, Part II** (4–4) Kimura, Kuo
Continuation of grammar, with more emphasis on written language and reading. Laboratory fee, $35 per semester. (Academic year)

5–6 **Intermediate Japanese, Part I** (3–3) Kimura
Reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Laboratory fee, $35 per semester. (Academic year)

7–8 **Intermediate Japanese, Part II** (3–3) Kimura
Continuation of reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Laboratory fee, $35 per semester. Prerequisite: Japn 5–6. (Academic year)

### Second Group

111–12 **Japanese Literature in Translation** (3–3) Chaves
An introductory survey of traditional and modern Japanese literature read in English translation. love and nature poetry; theater (classical drama, puppet plays); fiction; diaries. Particular emphasis is placed on the great women writers of Japan. (Academic year)

162 **Japanese Culture Through Films** (3) Shih, Chaves
Survey of the Japanese cultural heritage presented through films. Topics include literature, philosophy, art, religion, and social history from prehistorical times to the modern era. Lectures and discussion in English. (Spring)

## KOREAN

### First Group

1–2 **Beginning Korean, Part I** (4–4) Kim-Renaud
Fundamentals of grammar and pronunciation, with graded reading and practice in writing. Laboratory fee, $35 per semester. (Academic year)

3–4 **Beginning Korean, Part II** (4–4) Kim-Renaud
Continuation of grammar, with more emphasis on written language and reading. Laboratory fee, $35 per semester. (Academic year)

5–6 **Intermediate Korean** (3–3) Kim-Renaud
Reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Laboratory fee, $35 per semester. (Academic year)

# EAST ASIAN STUDIES

Program Committee: W.R. Johnson (*Director*), H.C. Hinton, Y.C. Kim, C.W. Shih, R. Thornton, R.Y. Yin

The School of International Affairs offers multidisciplinary programs leading to a Bachelor of Arts with a major in East Asian studies (with a focus on either China or Japan) and a Master of Arts in the field of East Asian studies.

*Bachelor of Arts with a major in East Asian studies*—The following requirements must be fulfilled.

1. The general requirements stated under the School of International Affairs.
2. Prerequisite courses—see the School of International Affairs, Curriculum Requirements.

3. Required courses for the major—for the China focus: Chin 5–6, 11, and either 163 or 164; Econ 169; for the Japan focus: Japn 1–2, 3–4, either 111 or 112, and 3 additional hours in Japanese language; Econ 170; for both the China and Japan focus: one course selected from Geog 127, 132, 133, 134, 146, 266; three courses selected from Hist 137, 188, 189, 195, and either 187 or 196 (courses covering both premodern and modern periods are recommended); PSc 170 or 173; three elective courses in economics, history, or political science that are not related to China or Japan and that are selected in consultation with the advisor.

4. Preparation of a substantial research paper in a two-semester research course or independent study related to the chosen focus on China or Japan. The courses taken to fulfill this requirement must be approved in advance by the program director.

*Master of Arts in the field of East Asian studies*—Prerequisite: the admission requirements stated under the School of International Affairs. Required: the general requirements stated under the School of International Affairs.

The program is available in a 30-semester-hour option with a thesis or a 36-semester-hour option without a thesis. Students electing the nonthesis option must prepare a substantial research paper in a two-semester readings/research course. (In the concentration in Chinese language and literature, only the thesis option is available.) Students with no previous course work in the modern history and politics of China and Japan should consult with the program director to determine ways to acquire this background.

A reading knowledge of Chinese, Japanese, or another approved East Asian language must be demonstrated. A special two-semester Chinese language course is available to help students meet this requirement. Japanese and Korean language courses are also available. Credit for language study is not counted toward degree requirements.

Students must complete course work related to East Asia in at least four of the following Departments: East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Political Science, and Art. (Those who choose the concentration in Chinese language and literature are excepted.)

Students in the thesis program must pass Master's Comprehensive Examinations in two fields, one in a major field (12 credit hours) and one in a minor field (6 credit hours). Students in the nonthesis program must pass the Examinations in three fields if they select one major field and two minor fields and in two fields if they select two major fields.

*Concentration in Chinese language and literature*—only the thesis option is available. Students must take 12 credit hours of Chinese literature and pass a Master's Comprehensive Examination in this major field. They must also take 6 hours of history courses and 6 hours of additional courses that pertain to East Asian studies and must pass a Master's Comprehensive Examination in one of these two minor fields.

The following graduate courses pertain to East Asian studies.

| | |
|---|---|
| Chin 271–72 | *Poetry of the Tang and Song Periods* |
| Chin 273 | *Yuan Drama* |
| Chin 277–78 | *Prose Narratives of the Song, Ming, and Qing Periods* |
| Econ 269–70 | *Economy of the People's Republic of China* |
| Econ 271 | *Economy of Japan* |
| Geog 266 | *Seminar: Geographic Perspectives on Contemporary China* |
| Hist 253–54 | *Readings Seminar: History of Sino-Soviet Relations* |
| Hist 255–56 | *Readings Seminar: U.S.–Soviet Strategic Relations Since World War II* |
| Hist 259–60 | *Research Seminar: Problems in U.S.–Soviet-Chinese Relations* |
| Hist 289 | *Readings/Research Seminar: Modern Japanese History* |
| Hist 293 | *Research Seminar: Modern East Asian History* |
| Hist 295–96 | *Readings Seminar: Modern Chinese History* |
| PSc 270–71 | *Politics of the People's Republic of China* |
| PSc 272 | *Foreign Policy of the People's Republic of China* |
| PSc 275 | *International Politics of the Far East* |
| PSc 276 | *Governments and Politics of Japan and Korea* |
| PSc 291 | *Colloquium: East Asia* |

## ECONOMICS

Professors J.W. Kendrick, C.T. Stewart, Jr., J. Aschheim, H. Solomon, C.Y. Hsieh (Emeritus), J.L. Gastwirth, M.A. Holman, R.M. Dunn, Jr., W.F.E. Long, S.E. Haber, A. Adams, R.S. Goldfarb, J.R. Barth, O. Havrylyshyn (Chair), A.M. Yezer, J.J. Cordes, J. Pelzman, J.E. Kwoka, R.P. Trost, J. Zeidner
Adjunct Professors T.F. Carroll, P. Swamy, J. Hardt, V. Tanzi, E.H. Solomon
Professorial Lecturers R.E. French, K.S. Flamm
Associate Professors R.Y. Yin, B.L. Boulier, H.S. Watson, M.D. Bradley
Adjunct Associate Professor M.A. Baily
Associate Professorial Lecturer S.N. Kirby
Assistant Professors V. Fon, S.C. Smith, M.B. Loewy, M.-H. Ye, R.F. Phillips, K. Kappagantula

*Bachelor of Arts with a major in economics (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite course—Econ 1–2.
3. Required courses in related areas—Math 41 and 42, or equivalent; Stat 111 and 112, or equivalent; 6 semester hours of a social science other than economics.
4. Required courses in the major—Econ 101, 102, 121, 198, and 15 additional semester hours of second-group economics courses to be approved by the departmental advisor.

*Minor in economics*—(a) 18 credit hours in economics, including Econ 1, 2, 101, 102, 121, and one other 100-level course in economics; (b) 6 credit hours of an approved statistics sequence, such as Stat 111–12; or 6 hours selected from Math 31, 32, 41–42, 51–52; or 3 hours of an approved statistics course plus 3 hours selected from Math 31, 32, 41–42, 51–52.

*Master of Arts in the field of economics*—Prerequisite: (1) a Bachelor of Arts degree with a major in economics or with substantial course work in economics; (2) an understanding of basic calculus, equivalent to Math 31–32 or 41–42; (3) Graduate Record Examinations for all applicants except foreign nationals.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) Econ 203–4, 205, and 275; (2) 12 additional semester hours to be selected from other third-group economics courses; (3) a Master's Comprehensive Examination in economic theory; and (4) either a thesis (Econ 299–300) or 12 semester hours selected from additional third-group economics courses. In some cases, up to 6 semester hours in courses outside the Department may be substituted for certain of the above requirements when it is deemed clearly important to the candidate's area of study.

*Doctor of Philosophy in the field of economics*—The Ph.D. program involves study in two sequential units. Unit I includes satisfactory completion of required course work, and passing the General Examination. This first unit must be concluded within five years after entry into the program. Upon successful completion of Unit I, students are considered for admission to Unit II, the dissertation stage, which must be completed within five years after entry. In all cases, however, the student is expected to complete the doctorate within eight years after admission. Students admitted to the second unit will be recommended by the Department of Economics for the Master of Philosophy degree.

Students must meet the general requirements stated under the Graduate School of Arts and Sciences. For Unit I, the requirements include Econ 202, 203, 204, 205, 206, 215, 216, and 275, plus 24 additional semester hours of approved graduate course work, and passing the General Examination in microeconomic theory, macroeconomic theory, and two other fields selected by the student and approved by the doctoral program committee. Examinations are given in the following fields: econometrics, economic development, environmental and natural resource economics, health economics, history of economic thought, industrial organization, international economics, labor economics, monetary theory and policy, public finance, regional and urban economics, and Soviet and East European economics.

Examinations: the field examinations that constitute the General Examination are

given at least two times per year. The requirements for the microeconomic and macroeconomic theory examinations must be met before any other field examinations may be taken. The microeconomic and macroeconomic theory examinations must be passed within six months of completing (a) 36 graduate credit hours toward the degree and (b) two years in the program, the time limit beginning when both (a) and (b) have been accomplished. To pass the General Examination, students must earn a grade of "satisfactory pass" or better in the field examination in microeconomic or macroeconomic theory and in one of the other two field examinations and no grade below "bare pass." Two of the field examinations may be taken a second time with the approval of the department and the dean. No further opportunity to take the examinations is permitted. Substitution of a field examination (in an area not originally chosen by the student) to satisfy the requirements of the General Examination is equivalent to taking a field examination a second time. Students should consult with the professors responsible for their fields and notify the department two months in advance of their intention to take the examinations. If such notification is not given sufficiently in advance, it may not be possible to sit for the examination. These examination requirements apply in full to all students who entered the economics Ph.D. program in the 1979 fall semester and thereafter.

For Unit II, the requirements include formulation of an acceptable dissertation proposal, completion of a dissertation that demonstrates the candidate's ability to do original research, and 24 hours of additional graduate course work, of which at least 12 hours must be dissertation research. In cases where knowledge outside the discipline of economics is critical to the student's research field, up to 6 semester hours in Unit II may consist of required courses outside of the Economics Department.

**Departmental prerequisite:** Econ 1–2 is prerequisite to all other courses in economics except Econ 217–18.

**First Group**

1–2 **Principles of Economics** (3–3) Dunn, Goldfarb, Loewy
Lecture (2 hours), discussion (1 hour). Survey of the major economic principles, institutions, and problems in contemporary life. Econ 1: Macroeconomics—national income concepts, unemployment and inflation, institutions of monetary control. Econ. 2: Microeconomics—supply and demand the price system and how it works, competitive and monopolistic markets (Econ 1 and 2—fall and spring)

**Second Group**

101 **Intermediate Microeconomic Theory** (3) Yezer, Boulier, Fo
Household behavior- utility maximization subject to budget constraint to derive demand behavior of households; firm behavior—profit maximization subject to cost conditions to derive supply behavior of firms; the basic competitive market model. Monopoly, introduction to oligopoly, and introduction to factor demand and supply. (Fall and spring)

102 **Intermediate Macroeconomic Theory** (3) Yin, Bradley, Loew
Investigation of the determinants of national income, inflation, unemployment, and interest rates. Alternative business cycle theories, with emphasis on the role of imperfect information, uncertainty, and expectations. (Fa and spring)

104 **History of Economic Thought** (3) Staff
History of the major schools of economic thought, influence of changing problems on the development of economic theory. Prerequisite: Econ 101, 102.

105 **Economic Conditions Analysis and Forecasting** (3) Kendric
Theory and empirical analyses of economic trends and fluctuations; use of economic indicators and simple econometric models. (Fall)

121 **Money and Banking** (3) Barth, Loew
The role of money, credit, interest rates, foreign exchange rates, and comme

cial banks and other financial institutions in the U.S. economy. (Fall and spring)

122 **Monetary Theory and Policy** (3) Aschheim, Loewy
Analysis of role of money in economic activity in terms of supply of and demand for loanable funds, interest rates, and price level. Problems of U.S. monetary policy. Prerequisite: Econ 121. (Spring)

123 **Introduction to Econometrics** (3) Trost, Phillips
Joint offering of the Economics and Statistics Departments. Construction and testing of economic models: regression theory, parameter estimation, and statistical techniques applicable to economic models. Prerequisite: Econ 101, 102; Math 31 or 41; Stat 112. (Spring)

130 **Comparative Economic Systems** (3) Aschheim
Critical exposition of fundamental economic concepts and theories of capitalism, communism, socialism, and fascism.

133 **Economy of the Soviet Union** (3) Pelzman, Hardt
Analysis and review of the economic development and performance of the Soviet Union from the pre-revolutionary period to the present. (Fall)

134 **Comparative Communist Economic Systems** (3) Pelzman, Hardt
Analysis and review of the economic development and performance of the East European economies in the post-World War II period. Soviet-type and alternative planning models. (Spring)

136 **Natural Resources and Environmental Economics** (3) Yezer
Analysis of market mechanisms that allocate energy and natural and environmental resources; investigation of actual and optimal resource allocation across uses and time; review of arguments for public intervention. (Spring)

141 **Women in the Labor Market** (3) Haber
Application of the theory of the household and investment in human capital to female labor force participation, marriage, and family formation; analysis of sex discrimination. (Spring)

142 **Labor Economics** (3) Haber
Analysis of labor supply and demand; measurement and theory of unemployment; occupational choice; wage differentials; labor market issues and policies. (Fall)

148 **Health Economics** (3) Baily
Analysis of the determination of prices, output, and productivity in the health services sector of the economy. (Fall)

151 **Economic Development** (3) Havrylyshyn, Smith
Theories and empirical studies of special relevance to the economic problems of developing countries. (Fall and spring)

153 **Income Distribution** (3) Haber, Goldfarb
An analysis of the distribution of income, with focus on policy issues relating to wealth and poverty. (Spring)

157 **Urban and Regional Economics** (3) Yezer
Analysis of the determinants of urban growth and development; firm location; the functioning of urban land and housing markets.

158 **Industrial Organization** (3) Kwoka
Analysis of market structure, conduct, and performance of firms in a market economy, with emphasis on case studies of U.S. industries. (Fall)

159 **Government Regulation of the Economy** (3) Kwoka
Economic analysis of antitrust and regulation in the American economy. Prerequisite: Econ 158 or 101. (Spring)

161 **Public Finance I** (3) Cordes, Watson
Theoretical and institutional analysis of government expenditures and intergovernmental fiscal relations. (Fall)

162 **Public Finance II** (3) Cordes, Watson
Theoretical and institutional analysis of tax policy and debt management. (Spring)

165 **Economics of Human Resources** (3) Stewart
Economic analysis of education and training, research and innovation, and related contemporary problems. (Fall)

169 **Introduction to the Economy of the People's Republic of China** (3) Yin
Background, organization, and operation of the economy. Appraisal of performance and analysis of problems of development. (Fall)

170 **Introduction to the Economy of Japan** (3) Staff
Analysis of the structure and growth of the Japanese economy. (Spring)

179 **U.S. Economic History** (3) Berkowitz
Same as Hist 179.

181–82 **International Economics** (3–3) Dunn, Pelzman
Econ 181: International trade theory and international monetary theory. Econ 182: Continuation of international monetary theory; economic development. (Academic year)

185 **Economic History and Problems of Latin America** (3) Staff
Analysis of present structures and problems of Latin American economies. (Spring)

198 **Proseminar in Economics** (3) Aschheim, Stewart
Preparation and presentation of a research paper in any field of economics agreed upon by student and instructor. Review of selected topics in contemporary economics. Open only to economics majors in their senior year. (Fall and spring)

199 **Independent Research in Economics** (3) Staff
Under the personal direction of an instructor. Limited to economics majors with demonstrated capability. Prior approval of instructor required. (Fall and spring)

**Third Group**

Third-group economics courses (except 211, 212, 214, 217–18, 221–22, 243, 247, 249, and 283–84) are designed for graduate students in economics. Graduate students in other disciplines may register for these courses after having completed Econ 217–18 or 101 and 102. In addition to these prerequisites and any others specific to the particular course, calculus is required in some sections of third-group economics courses.

202 **History of Economic Thought** (3) Staff
Critical analysis and interpretation of the development of economic theory from Plato through the formulation of the Neoclassical Synthesis paradigm and contemporary revisions of the Neoclassical Synthesis. (Fall)

203–4 **Microeconomic Theory** (3–3) Goldfarb, Fon, Ye
Econ 203: Demand, production, cost theory. Prerequisite: Econ 101 or equivalent. Econ 204: Market structure, welfare, general equilibrium. Prerequisite: Econ 203. (Econ 203 and 204—fall and spring)

205 **Macroeconomic Theory I** (3) Barth, Bradley
Alternative theories of income, employment, and the price level; fiscal and monetary policy impacts; the role of expectations in the economy. (Fall and spring)

206 **Macroeconomic Theory II** (3) Barth, Bradley
Continuation of Econ 205. Extensions of alternative models of income determination; application of analytic frameworks to the U.S. economy; examination of uncertainty and policy strategy. (Fall and spring)

208 **National Income, Product, and Productivity** (3) Kendrick
Output, input, and productivity relationships by industry; income, outlay, flow-of-funds, and balance sheets by sector; uses of accounts for analysis and projections. (Fall)

209 **Capital and Growth Theory** (3) Hase
Growth models under both the paradigm of the Neoclassical Synthesis and that of Post-Keynesian economics. Other selected topics in Post-Keynesian economics and recent attempts to attain a new synthesis in economic theory. Prerequisite: Econ 205.

211 **Analytic Methods for Management and Policy I** (3) Staff
Primarily for graduate students in fields other than economics. Various quantitative techniques, such as simulation, cost–benefit analysis, mathematical programming, and difference equations, and their roles in policy analysis are presented in a theoretical context and viewed in terms of their utility in the management/policy context. Prerequisite: Stat 51 and Econ 217 or equivalent. (Fall)

212 **Analytic Methods for Management and Policy II** (3) Staff
Primarily for graduate students in fields other than economics. A more advanced treatment of the quantitative techniques introduced in Econ 211, including cost–benefit analysis and mathematical programming techniques. Additional topics include applications of game theory, econometric modeling, and simulation models to policy analysis. Prerequisite: Econ 211. (Spring)

214 **Survey of Mathematical Economics** (3) Fon
Primarily for graduate students in fields other than economics. Students in economics should consult the instructor before taking this course. Topics include differentiation, partial differentiation, and economic optimization problems; comparative statics; input–output analysis; difference, differential equations, and economic applications. Prerequisite: one semester of calculus and Econ 217–18.

215–16 **Mathematical Economics** (3–3) Fon
Formulation and application of mathematical models in economic theory. Prerequisite: a one-year calculus sequence. Open to undergraduates. (Academic year)

217–18 **Survey of Economics** (3–3) Haber, Holman, Watson
Intermediate-level microeconomic theory (Econ 217) and intermediate-level macroeconomic theory (Econ 218) for graduate students in fields other than economics. Departmental prerequisite waived. (Econ 217 and 218—fall and spring)

221–22 **Applied Economics** (3–3) Adams
An extension of microeconomic welfare analysis to the study of contemporary policy issues, with an emphasis on resource allocation decisions in the public sector; models of individual choice making in policy analysis; and policy aspects of production, cost, and organizational decision making. Primarily intended for students in fields other than economics. Prerequisite: Econ 217 or equivalent. (Academic year)

223–24 **Monetary Theory and Policy** (3–3) Aschheim, Barth
Theory of monetary policy within the framework of contemporary American central banking. (Academic year)

233 **Rural Development Policies** (3) Carroll
Review of poverty-oriented rural development strategies in the LDCs. Theories and experiences of land reform, peasant cooperatives, small-farm technology, rural–urban linkages, and planning a rural service network. (Fall)

234 **Rural Development Projects** (3) Carroll
Design and evaluation of rural-based investment projects, including multisector approaches to integrated planning of rural regions, with case studies drawn from the experience of international agencies. Prerequisite: Econ 233 or permission of instructor. (Spring)

235 **Energy Resources and Policy** (3) Staff
Consideration of economic and related policy issues directed at energy problems. (Fall)

236 **Middle East Economics** (3) Staff
Survey of Middle East economics emphasizing the application of economic tools to selected issues of importance.

237 **Economics of the Environment and Natural Resources** (3) Holman
Analysis of public policy problems relating to the environment and natural resources development and management. (Spring)

239 **Economics of Defense** (3) H. Solomon
Economic analysis applied to national security planning and objectives. Analysis of defense establishment problems, including manpower, the defense industry base, procurement policy. (Spring)

241–42 **Labor Economics** (3–3) Goldfarb
Theory of wages and employment, analysis of labor supply and demand. Analysis of unemployment; unions; wage regulation. Econ 241 is prerequisite to Econ 242. (Academic year)

243 **Seminar: Human Resource Policy** (3) Staff
The shifting composition of the American work force and its measurement; linking of work and welfare; preparation for work; evaluation of public investment in human resource development. Open to undergraduates. (Fall)

244 **Economics of Education** (3) Staff
Returns to investment in education, allocation of resources to and within education, educational financing.

245–46 **Industrial Organization** (3–3) Kwoka
Econ 245: Economic theory and evidence regarding industrial market structure, conduct, and economic performance. Econ 246: Economic issues in antitrust and government regulation of the U.S. economy. Econ 245 is prerequisite to Econ 246. (Academic year)

247 **Seminar: Industrial Organization** (3) Staff
Selected topics in regulatory and antitrust economics. Prerequisite: Econ 101 or equivalent. Offered off campus only. (Spring) Baily

248 **Health Economics** (3)
Demand for medical care; organization of the health care delivery industry; policy issues on regulation, efficiency, and allocation of health care services. (Spring)

249 **Seminar: Industrial Organization—The Telecommunications Industry** (3)
Structure, interrelationship, and function of the telecommunications industry within a changing regulatory framework. Offered off-campus only.

251 **Economic Development Theories** (3) Havrylyshyn, Smith
Basic theories of economic growth and development. Issues covered may include measurement of economic growth; industrialization of agrarian economies; income distribution, employment, and poverty; international trade policies; debt problems of developing countries. (Fall and spring)

252 **Economic Development Planning** (3) Havrylyshyn, Smith
Theories and techniques of development planning and the experience of developing countries. Emphasis on tools of planning, particularly macro models, multisector models (including input–output, social accounting, linear programming, and computable general equilibrium models), and cost-benefit analysis in project appraisal. (Fall and spring) Kendrick

253 **Productivity Analysis** (3)
Concepts, measurement, and analysis of productivity in business and government at aggregate and organizational levels. (Fall) Steven

255 **Economics of Technological Change** (3)
Economics of research and development and the role of government in promoting development and use of new technology. (Spring) Yezer

257 **Regional Economics** (3)
Study of regional planning and growth models, including input–output programming, and econometric models used by planning agencies; analysis of interregional production, trade, migration, firm location, and price models. (Fall) Yezer

258 **Urban Economics** (3)
Analysis of spatial relationships among economic activities within an urban area including the urban land, labor, and housing markets; urban transportation models; fiscal relationships among jurisdictions. Prerequisite: Econ 2[illegible] or permission of instructor. (Spring)

**259 Income Distribution** (3) Stewart, Carroll
Theoretical and empirical analysis of income distribution, including analysis of policies related to reducing income inequality. (Spring)

**261 Welfare Economics** (3) Stewart
Theories of welfare economics and their applications to public policy; analysis of selected topics in public policy. (Fall)

**263 Theory of Public Finance I** (3) Cordes, Watson
Allocation and distribution aspects of government budget policy, including critical analysis of theories and principles of expenditures, and intergovernmental fiscal relations. (Fall)

**264 Theory of Public Finance II** (3) Cordes, Watson
Analysis of the effects of taxation on resource allocation and income distribution; impact of the public debt. (Spring)

**265 Seminar: Fiscal Policy in Developing Countries** (3) Tanzi
Examination of topics in the public finances of developing countries, including taxation, expenditure, and macroeconomic aspects. (Fall)

**267 Seminar: Soviet Economy** (3) Pelzman, Hardt
An analysis of the Soviet-type economy. Issues discussed include growth strategy, investment and price policy, and foreign trade and aid strategy. Admission by permission of instructor. (Fall)

**268 Seminar: Economic Theory and Development in Communist Countries** (3) Pelzman, Hardt
An analysis of the application of the Stalinist model to Eastern Europe and the resulting reforms. Admission by permission of instructor. (Spring)

**269 Economy of the People's Republic of China I** (3) Yin
Analysis of organization, operation, policies, and problems. Development of the economy since 1949. (Fall)

**270 Economy of the People's Republic of China II** (3) Yin
Continuation of Econ 269, examining critical problems of development. Prerequisite: Econ 269 or permission of instructor. (Spring)

**271 Economy of Japan** (3) Staff
Analysis of Japanese economic institutions and their contribution to Japan's development. (Fall)

**275 Econometrics I: Introduction** (3) Trost, Phillips
Single-equation models of economic behavior. Statistical methods for testing economic hypotheses and estimating parameters. Topics include heteroscedasticity, serial correlation, and lagged dependent variables. Prerequisite: Econ 123. Some exposure to matrix algebra is helpful, but not required. (Fall and spring)

**276 Econometrics II: Simultaneous-Equation Models** (3) Trost, Phillips
Simultaneous-equation models of economic behavior. Optional topics are maximum-likelihood estimation, limited dependent variables, and quantum-response models. Prerequisite: Econ 275. Recommended: a course in matrix algebra. (Spring)

**277 Laboratory in Applied Econometrics** (3) Trost
Application of econometric theory. Use of econometric software. Each student will be required to write an empirical research paper. Prerequisite: Econ 275 or, with the permission of the instructor, Econ 123.

**279 Methods in Economic Statistics** (3) Gastwirth
Joint offering of the Economics and Statistics Departments. Application of statistical methods to economic data. Univariate and multiple regression and nonparametric techniques are used to analyze economic data. Measures of inequality, economic concentration, and forecast accuracy are discussed. Prerequisite: a one-year course in statistics. (Fall)

**281–82 International Economics** (3–3) Dunn, Pelzman, Anderson
Econ 281. International trade theory, including alternative models of the gains from trade and evaluations of the new justifications for protectionism, commercial policy, factor flows, and trade and investment with multinational corporations. Econ 282. International finance, including alternative models of

balance of payments behavior and adjustment, payments accounting, exchange markets, and alternative exchange-rate regimes. Prerequisite: some sections may require calculus or permission of instructor.

283–84 **Survey of International Economic Theory and Policy** (3–3) Staff
For graduate students in fields other than economics. Econ 283: Survey of international trade theory and policy; application of comparative advantage and other arguments for trade; impact of trade on a domestic economy; new arguments for protectionism; regional trading blocs. Econ 284: International finance; theory and policy of balance of payments accounting; exchange markets; alternative models of balance of payments determination and adjustment; new theories of the behavior of flexible exchange rate systems. (Academic year)

285–86 **Economic Development of Latin America** (3–3) Flamm
Econ 285: Diversity of structures of Latin American economies; relevant theories; import substituting industrialization; inflation; problems of underemployment and income distribution. Econ 286: Structure of trade; protection, exports, and economic development; regional and global economic integration; foreign investment, multinational enterprise, and technology transfer. (Academic year)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Same as IAff 287.

290 **Principles of Demography** (3) Boulier
Introduction to basic demographic perspectives and data; methods for analysis of population size, distribution, and composition; determinants and consequences of population trends. Same as Geog/Soc/Stat 290. (Fall)

291 **Methods of Demographic Analysis** (3) Boulier
Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data. Same as Geog/Soc/Stat 291. (Spring)

298 **Reading and Research** (3)
Limited to master's degree candidates. (Fall and spring)

299–300 **Thesis Research** (3–3)
(Fall and spring)

**Fourth Group**

Fourth-group economics courses are limited to graduate students and are primarily for doctoral candidates. They are offered as the demand requires and may be repeated for credit with permission of the instructor.

305 **Seminar: Macroeconomics** (3) Barth, Bradley
Selected topics in macroeconomics. Prerequisite: Econ 205. Staff

310 **Economic Methodology** (3)
Methodology of economics, review of selected theoretical issues in economic theory. Prerequisite: six semester hours of graduate courses in economic theory. Staff

312 **Seminar: Price Theory** (3)
Discussion of topics in price theory from recent journal articles. Heiab

313 **Seminar: Economic Thought** (3)
Continuation of Econ 202. Principal trends in economic thought. H. Solomon

315 **Seminar: Topics in Mathematical Economics** (3)
Intensive study of selected topics, including economic activity analysis, risk and uncertainty, and other topics of current interest. Prerequisite: Econ 215–16. Aschheim, Barth

321 **Seminar: Monetary Theory** (3)
Recent developments in monetary theory. Goldfarb

341 **Seminar: Labor Economics** (3)
Current problems in theory and policy. Kwoka

345 **Seminar: Industrial Organization** (3)
Review of recent literature and current policy issues. Admission by permission of instructor.

348 **Topics in Health Economics** (3) Staff
An in-depth treatment of advanced topics in health economics. Prerequisite: Econ 248 or permission of instructor.

351 **Seminar: Economic Development** (3) Havrylyshyn, Smith
Analysis and review of recent theoretical work in the field, and/or selected topics of current policy interest. Prerequisite: Econ 251 and 252 or permission of instructor.

363 **Seminar: Public Finance** (3) Cordes, Watson
Selected topics of current interest.

367 **Seminar: Soviet Planning in Theory and Practice** (3) Pelzman
An analysis and review of recent work on planning theory as applied to the Soviet Union. Marxist ideology with modification is taken as the primary force shaping the objective function of Soviet planners. Soviet economic performance is evaluated based on this criterion. Prerequisite: Econ 203–4 and 267 or permission of instructor.

378 **Seminar: Topics in Econometrics** (3) Swamy
Research seminar covering current econometric literature and special topics. Admission by permission of instructor. Same as Stat 378.

379–80 **Readings in Economic History** (3–3) Staff
Joint offering of the Economics and History Departments. Econ 379: American economic history. Econ 380: Modern European economic history. Prerequisite: the appropriate second-group preparation and consent of instructor. (Academic year)

390 **Seminar: International Economic Theory** (3) Dunn, Pelzman
Limited to graduate students, primarily for doctoral students. Examination of recent contributions in this field.

391 **Seminar: International Economic Policy** (3) Staff
Topics selected from current significant policy problems.

397 **Dissertation Proposal Seminar** (3) Staff
Limited to Doctor of Philosophy candidates in Unit II. Critical analysis of current research. Formulation of a dissertation proposal and development of dissertation research strategies.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## EDUCATIONAL LEADERSHIP

Professors M.N. Rashid, J.G. Boswell, D.A. Moore, F.J. Brown, S.R. Paratore, R. Ferrante, E.J. Gleazer, Jr. *(Visiting)*, M.A. Burns, G.W. Smith *(Chair)*, J.A. Greenberg, J.D. Fife, M.R. Phelps, D.H. Holmes
Adjunct Professor R.C. Rist
Associate Professors G.E. Schou, D.M. Saunders
Associate Professorial Lecturer C. Gerhard
Assistant Professor W.F. Lynch *(Visiting)*
Instructors C.B. Stapp, J.A. Landau *(Visiting)*

See the School of Education and Human Development for programs of study leading to the degrees of Bachelor of Arts in Education and Human Development, Master of Arts in Education and Human Development, Master of Education, Master of Arts in Teaching, Education Specialist, and Doctor of Education.

**First Group**

100 **Special Workshop in Education and Human Development** (arr.) Staff
Topics to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

### Second Group

**104 Psychology for Learning and Teaching** (3) Gerhard
Principles, theory, nature, and course of learning and teaching processes. Examination and analysis of the strategies and dynamics of teaching and learning in behavioral settings. Three-hour fieldwork sessions. (Fall and spring)

**112 Measurement and Evaluation** (3) Staff
Basic evaluative measurement techniques: selection, administration, and interpretation of standardized tests; test construction, evaluation procedures, statistical analysis. (Fall and spring)

**120 Experimental Course in Education and Human Development** (arr.) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

**125 Museums as Cultural and Educational Resources** (3) Staff
Use of the museum for knowledge and enjoyment; museum objects as primary sources; meetings in art, history, and science museums in the metropolitan area. (Spring)

**171 Introduction to Human Development I** (3) Staff
*(Formerly Educ 71)*
Lectures and fieldwork. All aspects of development through adolescence, child study techniques. Two to three hours weekly field experience in appropriate setting. (Fall and spring)

**172 Introduction to Human Development II** (3) Staff
*(Formerly Educ 72)*
Adult development from young adulthood to old age. Dominant psychological, social, and physical competencies; motivational changes; coping styles; maladaptive behavior. Three hours weekly field experience in appropriate agency setting. (Fall and spring)

**180 Computer Literacy** (3) Lynch
A hands-on introduction to micro, mini, and mainframe computing systems, operating environments. Word processing, communications, qualitative analysis, database management, and graphics software. Personal productivity applications are emphasized through demonstrations, guided practice, and a supervised individual project. No previous computer experience required. May be taken for graduate credit. (Fall and spring)

**187 Sign Language and Deafness I** (3) Staff
*(Formerly Educ 87)*
Basic expressive and receptive skills in sign language of the deaf.

**188 Sign Language and Deafness II** (3) Staff
*(Formerly Educ 88)*
Discussion of issues and implications of deafness. Prerequisite: Educ 187.

**193–94 Research and Independent Study** (arr.) Staff
Individual research under guidance of a staff member. (Academic year)

**200 Special Workshop in Education and Human Development** (arr.)
Topics to be announced in the *Schedule of Classes*. May be repeated for credit.

### Third Group

Departmental prerequisite: A degree from an accredited institution and adequate professional preparation are prerequisite to all second-group courses. With permission of the instructor, undergraduate students in their senior year may enroll in second-group courses.

**201–2 International Education** (3–3) Moore
A study of a selected sample of foreign education systems as they reflect culture, history, values, people, and current changes in the world today. Research techniques to develop a global frame of reference. Foreign resources and resources unique to the Washington area are utilized. (Summer)

203–4 **Comparative Education (3–3)** Moore and Staff
A systematic investigation of the educational structure and practices of selected representative school systems throughout the world. Emphasis on development of a methodology for comparative study. (Academic year)

205 **International Experiences** (1 to 6) Staff
*(Formerly Educ 221)*
Travel to a foreign country for specific study and research. Admission by permission of the instructor.

207 **Instructional Materials, Media, and Resources** (3 to 6) Staff
Review of technological contributions to education. Examination of current and emerging developments. Framework for study of selection, utilization, integration, and evaluation of audiovisual media in the teaching/learning process. (Summer)

208 **Human Development (3)** Rashid
Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research. (Fall and summer)

209 **Child Development (3)** Rashid
Interdisciplinary approach to child development and behavior. Practical implications of research in disciplines contributing to knowledge about childhood. (Fall)

210 **Adolescent Development (3)** Rashid
Interdisciplinary approach to adolescent development and behavior. Practical implications of research in disciplines contributing to knowledge about adolescence. (Spring)

211 **Computers in the Classroom (3)** Lynch
Fundamental microcomputer concepts and skills needed to use the computer in the classroom. Introduction of programming languages, general-purpose applications software, and educational software (courseware), together with important educational issues concerning their use in the classroom. Prerequisite: Educ 180. (Spring)

212 **Quantitative Methods I: Introduction to Survey Measurement and Research** (3) Staff
Introduction to measurement techniques and evaluation. Emphasis on application and interpretation of data-gathering techniques and descriptive statistics. (Fall, spring, and summer)

213–14 **Western Educational Thought** (3–3) Boswell
Following the themes of certainty, equality, and progress, this course examines the ideas of selected philosophers in their historical context and relates them to education. Educ 213: From Sumer to the Enlightenment; Educ 214: From the Enlightenment to the present with concentration on the American experience. (Fall and spring)

216 **Advanced Study of the History of Education (3)** Boswell
Individually planned program of study on topic of student's interest. Prerequisite: Educ 213–14 or the equivalent.

217 **Advanced Study of the Philosophy of Education** (3) Boswell
Individually planned program of study on topic of student's interest. Prerequisite: Educ 213–14 or the equivalent.

218 **Social Foundations of Education (3)** Boswell
The relationship between school and society: social, economic, and political purposes of schooling as well as forces that shape policies and school curricula. Contemporary issues and their implications for the future.

220 **Experimental Course in Education and Human Development** (arr.) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

222 **Museum Studies** (3) Stapp
*(Formerly Educ 310)*
Study of the museum's functions and its educational roles. Admission by permission of instructor. (Summer)

223 **Museum Audiences** (3) Staff
*(Formerly Educ 311)*
Study of the many audiences of many ages who use and enjoy museums; appropriate museum and outreach practices. Admission by permission of instructor. (Fall)

224 **Communication Skills** (3) Staff
*(Formerly Educ 124)*
Theory and practice in the development of communication skills in the museum. Educational concepts; teaching strategies and techniques; institutional liaison and group process. Admission by permission of the instructor. (Summer)

226 **Internship and Seminar in Museum Education** (6) Stapp
*(Formerly Educ 312)*
Four-day-a-week placement in education departments in area museums supervised by George Washington University faculty. On-campus seminar includes grant proposal writing. Admission by permission of instructor. (Spring)

227 **Museum Evaluation** (3) Staff
*(Formerly Educ 313)*
Evaluation and research methods appropriate to the museum setting. Review of research on museum audiences and design of program and exhibit evaluations. Admission by permission of instructor. (Summer)

228 **Selected Topics in International Education** (3) Moore
*(Formerly Educ 328)*
Investigation of historical development of international education; research on selected topics of general importance to the field of international education. Admission by permission of instructor. (Fall)

230 **Managing Computer Applications** (3) Ferrante
For managers and prospective managers in education and human services who are concerned with the automation of their operations. Students will acquire the basic principles needed to design, implement, and manage an information system. Prerequisite: permission of instructor. (Spring and summer)

233 **Supervised Experience in Education and Human Development Services** (3 to 6) Staff
*(Formerly Educ 133)*
Fieldwork, internship, and instructional practice: (1) higher education (Greenberg); (2) museum education (Stapp). Admission by permission of instructor. (Fall and spring)

240 **Proposal Writing** (3) Ferrante
The preparation of proposals for educational, business, and industrial applications, including those submitted for funding. Many styles and formats are illustrated. Each student will prepare a proposal in cooperation with an organization or agency. (Fall and summer)

242 **Fundamentals of Educational Administration** (3) Brown
Organization, structure, and governance of public education: federal, state, and local responsibilities. Basic administrative/leadership theory. Roles and functions of school administrators.

243 **Human Relations in Educational Management** (3) Saunders
Principles and practices in human relations for teachers, administrators, other school personnel, parents, and community leaders. Current theoretical and research findings; applications to social change; techniques of working with individuals and groups.

246 **Administrative Issues in Education** (3) Saunders
Administrative strategies and practices appropriate to problems in education.

248 **Supervision of Instruction** (3) Saunders
Study of interdisciplinary foundations of supervision. Special attention to the function of theory, change, individual and group relationships in organiza-

tions, staff influence processes, talent utilization, and evaluation of programs and staff. (Summer)

259 **The Principalship, K–12** (3) Saunders
A general introduction to the principalship. Administrative tasks and procedures are stressed, together with the principal's role in handling educational issues and problems.

260 **Supervision in the Elementary and Secondary School** (3) Saunders
For experienced teachers and administrators. Review of modern supervisory concepts, including practices in schools. Prerequisite: Educ 248. (Spring)

267 **Practicum in College Student Development** (3 to 6) Burns
*(Formerly Educ 377)*
Supervised practical experience in college student development programs. Admission by permission of instructor. (Fall and spring)

268 **Power, Leadership, and Education** (3) Boswell
*(Formerly Educ 232)*
The nature of power, leadership, and education; the relationship of power to leadership; the essential nature of education in the exercise of power and leadership in a democratic setting. (Fall)

269–70 **School Business Management** (3–3) Brown
Educ 269: Philosophy, responsibilities, and functions of school business management. Educ 270: Practicum in school business management. Educ 269 is prerequisite to Educ 270. (Academic year)

271 **Policy-Making for Public Education** (3) Boswell, Ferrante
The nature of educational policy; the role of single-interest groups, the courts, legislative bodies, administrative bureaucracies, and professionals in establishing parameters and allocating resources. Analysis of specific techniques of policy formation. (Summer)

272 **Educational Planning** (3) Staff
An examination of the planning movement in education: its historical development and the recent shift in premises, context, and expectations. Different approaches to the planning process: its relationship to the concepts of systems and futurism; participatory, sectorial, and regional aspects; role of research, and overview of main analytical techniques currently in use. (Fall)

273 **Foundations of College Student Development** (3) Burns
*(Formerly Educ 375)*
College student development theories, practices, and problems, including historical overview and human development theories related to college students. (Fall)

274 **Group and Organizational Theories** (3) Burns
*(Formerly Educ 376)*
Focus on theorists, including Argyris, Blau, Miles, Festinger, and Lewin, and practical application of theories to various organizational settings and individuals. Prerequisite: permission of instructor. (Spring)

275 **School Finance** (3) Brown
Issues in financial support of public education. Local, state, and federal roles. Budget development and administration.

276 **Public Relations in School Administration** (3) Brown
The function, purposes, and resources of school public relations. Development of skills in planning public relations programs and activities. Theory and practice of effective communication.

277 **Dynamics of Change** (3) Boswell
An analysis of the process of change, particularly as it relates to educational policy. Comparison of theories; analytical tools; historical precedents; examples of federal educational policies.

278 **School Law** (3) Saunders
Constitutional and statutory provisions for public school education; origin and legal status of the local school unit; nature of the school board; legal status of teachers and administrators; legal rights and responsibilities of parents and pupils. (Spring)

279 **Practicum in Supervision** (3 to 6) Brown, Saunders
*(Formerly Educ 304)*
Practical experience in supervision of instruction. Admission by permission of instructor. (Fall and spring)

280 **Internship: Supervision** (3 to 6) Brown, Saunders
*(Formerly Educ 305)*
Service in a school situation directed by the University's faculty and school systems; integration of theory and practice. (Fall and spring)

281 **Program Evaluation: Theory and Practice** (3) Holmes
A general introduction to the theory of evaluation of social programs. Overview of evaluation models, methodology associated with program evaluation, and examination of evaluation in the context of political and social environments. (Fall)

282 **Administration of College Student Development Services and Programs** (3) Burns
*(Formerly Educ 370)*
An overview of student affairs administrative practices, including needs assessment, planning models, budgeting, policy development, program development, facility management, evaluation, and team building. Admission by permission of instructor. (Fall)

283 **Higher Education in the United States** (3) Burns, Greenberg
History, scope, purpose, present status, programs, and trends in higher education in the United States. (Fall and spring)

284 **Administration of Higher Education** (3) Burns, Ferrante, Fife
Government, organization, and administration of colleges and universities; duties of trustees and administrators. (Fall and spring)

285 **Education and National Development** (3) Boswell
Examination of the basic assumption that education contributes to national development. In addition to economic growth and civic identity, what constitutes national development in advanced industrial societies and societies moving to industrialism? What role does education play in promoting this process? (Fall)

286 **Interpretation in the Historic House Museum** (3) Stapp
Same as AmCv 286. Seminar integrating advanced practices of museum education with current scholarship in architectural history, material culture, social history, and women's studies. Extensive use of Washington museum resources. Open to undergraduate and graduate students. (Fall)

291 **Educational Facilities Planning** (3) Brown
Principles of school plant planning; site selection; evaluation of existing buildings; adaptation to curricular needs; building operation and maintenance; disposition of surplus facilities; energy and accessibility considerations.

292 **Practicum in Program Evaluation** (3 to 6) Holmes
Supervised practical experience in field placements. Admission by permission of instructor. (Fall and spring) Staff

293–94 **Research and Independent Study** (1 to 3)
Individual research under guidance of a staff member. Program and conferences arranged with an instructor. (Academic year)

295 **Quantitative Methods II: Research Procedures** (3) Paratore, Smith, Holmes
Required of all candidates for master's degrees in education. Analysis of scientific approaches to problems in education; evaluation of research techniques. Prerequisite: Educ 112, 212; or equivalent. (Fall and spring)

297 **Personnel Administration** (3) Brown
Organization and administration of personnel programs for educational institutions. Basic philosophy, principles, responsibilities, and functions; current issues.

290–300 **Thesis Research** (3–3) Staff
Required of M.A. in Ed.&H.D. degree candidates writing master's theses. (Fall and spring)

**Fourth Group**

A master's degree from an accredited institution is prerequisite to all third-group courses. All third-group seminars are open to doctoral candidates and to other post-master's degree students with approval of instructor. Study is individually planned on the basis of competence and to meet identified professional needs or field requirements.

301 **Advanced Study: Ideas, Issues, and Practices in Education** (3) Boswell, Phelps
*(Formerly Educ 401)*
For precandidates for the Ed.D. Alternative means of responding to the complexities of the educational process. Topics vary but concern education as an individual process and as sociocultural preservation and renewal.

302 **Quantitative Methods III: Inferential Techniques** (3) Holmes, Paratore, Smith
Educ 302 or Stat 105 is required of all doctoral students in education. Prerequisite: Educ 212 or a basic statistics course and permission of instructor. (Fall and spring)

303 **Data Analysis** (3 to 6) Staff
Use of computer in data analysis. For doctoral students at the dissertation-planning stage. (Fall and spring)

306 **Quantitative Methods IV: Advanced Research Design** (3) Holmes, Paratore, Smith
Required of all doctoral students in education. Evaluation and application of educational research designs. Prerequisite: Educ 302 or equivalent. (Fall and spring)

307 **Qualitative Research Methods** (3) Holmes and Staff
*(Formerly Educ 301)*
A general introduction to qualitative research procedures in social science research. Application of qualitative methods, design, analysis. (Fall)

329 **Seminar in Program Evaluation** (3) Holmes
Contemporary problems and issues in evaluation of social programs: design, implementation, analysis, and utilization. (Spring)

334 **Doctoral Internship in Educational Policy** (3 to 6) Holmes
*(Formerly Educ 444)*
Supervised internship in education or human services settings for advanced doctoral students.

340 **Methods of Policy Analysis in Education** (3) Holmes, Staff
Modes of analysis employed in the study of educational policy issues. Alternative methods of analysis for policy formation, implementation, and impact assessment. Both theoretical and case study materials are used. Prerequisite: Educ 295. (Fall and spring)

341 **Cognitive Models and Instruction** (3) Rashid
Cognitive models (Guilford, Bruner, etc.) are analyzed as the theoretical basis for planning instructional episodes appropriate at various levels—childhood through adulthood. (Fall)

342 **Language Development** (3) Rashid
Nature of language acquisition and development; emphasis on sociolinguistics and psycholinguistics most pertinent to education. (Spring)

343 **Advanced Studies in Human Development** (3) Rashid
Review and consideration of empirical research studies on selected topics in human development. Issues, instrumentation, and research needs in respect to each topic discussed. Admission by permission of instructor. (Spring)

344 **Adult Development and Aging** (3) Rashid
Theories and research on personality and cognition in adulthood and old age. Emphasis on evaluating research designs and methods and deriving implica-

tions of findings for gerontological programs and selected professional roles (Spring)

345 **Advanced Studies in Educational Policy Analysis** (arr.) Holmes
*(Formerly Educ 445)*

352 **Seminar: Western Educational Thought** (arr.) Boswell
*(Formerly Educ 402)*

353 **Seminar: Higher Education Administration** (arr.) Greenberg, Ferrante, Gleazer
*(Formerly Educ 422)*

354 **Seminar: Administration and Supervision** (arr.) Brown, Saunders
*(Formerly Educ 431)*

355 **Seminar: Applied Educational Administration** (3 to 6) Brown, Saunders
*(Formerly Educ 399)*
Application of the theories and principles of administration to public and private schools. Field experience in a phase of administration and supervision. Admission by permission of instructor. (Fall and spring)

356 **Seminar: Human Growth and Development** (arr.) Rashid
*(Formerly Educ 405)*

372 **Internship in Higher Education** (3 to 6) Greenberg and Staff
Supervised experiences in selected areas in college teaching. Admission by permission of instructor. (Spring)

373 **The Community/Junior College** (3) Greenberg, Gleazer
The two-year college as it relates to secondary education, four-year colleges and universities. Objectives, curricula, students, faculty, legal concerns, and special problems of two-year colleges. (Fall and spring)

374 **Current Issues in Higher Education** (3) Ferrante
Prerequisite: Educ 283, 284. (Spring) Staff

378 **Financing Higher Education** (3)
*(Formerly Educ 392)*
Analysis of private, state, and federal revenue sources; student aid, program budgets, and financial methods and practices. (Spring) Greenberg, Ferrante

379 **Administration and Governance of Two-Year Colleges** (3)
*(Formerly Educ 364)*
A study of the community/junior college, focusing on administrative patterns and national, regional, state, and local influences, as well as the theory and structure of two-year college organization. (Fall and spring) Fife

380 **Legal Problems in Higher Education** (3)
*(Formerly Educ 390)*
Investigation of legal problems in higher education related to the legal structure of higher education, religious concerns, students, faculty, and academic programs. (Spring) Fife

381 **College and University Curriculum** (3)
*(Formerly Educ 391)*
Development, patterns, creative design, issues, problems, evaluation, and trends in the higher education curriculum. (Fall) Greenberg and Staff

382 **Instructional Strategies in Adult Learning Programs** (3)
Methods, techniques, and devices for adult learning; developing action oriented learning situations in adult learning programs. (Fall and spring) Ferrante

384 **College and University Governance** (3)
*(Formerly Educ 394)*
Organizational and administrative structures, patterns, and relationships in higher education. Prerequisite: Educ 284. (Fall) Ferrante, Fife, Greenberg

385 **Problems and Practices in Educational Administrative Organization** (3 to 6)
*(Formerly Educ 395)*
Application of principles and practices concerned with change and evaluation of educational administration.

386 **Internship: Higher Education Administration** (3 to 6) Greenberg
*(Formerly Educ 396)*
Service in a higher education situation directed by the University and the cooperating institution to integrate theory and practice. (Fall and spring)

387 **Internship: Administration** (3 to 6) Brown, Saunders
*(Formerly Educ 397)*
Service in an educational institution or education-related program directed by the University's faculty. (Fall and spring)

388 **Case Studies in Higher Education Administration** (3) Ferrante
An analysis of case studies related to administrative functions in colleges and universities.

390 **Pre-Dissertation Seminar** (3 to 6) Staff
*(Formerly Educ 490)*
Required of all Ed.D. degree candidates. Approval of the dissertation research design is necessary for successful completion of the seminar. Admission by permission of instructor.

391 **Dissertation Research** (arr.) Staff
*(Formerly Educ 491)*
Preparation of a research outline; research and writing of an approved doctoral dissertation under the direction of major advisor and dissertation committee. Prerequisite: Educ 390

## EDUCATION POLICY—DOCTORAL PROGRAM

**Doctoral Committee on Education Policy**
A.V. Adams *(Chair)*, J.R. Henig, A.D. Kirsch, C.J. Lange, M.N. Rashid, C.T. Stewart, Jr., J.L. Tropea

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Doctor of Philosophy in the field of education policy. The program is directed by a committee whose members are drawn from the School of Education and Human Development and from the Departments of Economics, Political Science, Psychology, Sociology, and Statistics/Computer and Information Systems.

This program is concerned with policy research and analysis as it relates to education, broadly conceived. It is intended for those who wish to pursue or continue academic careers or careers in policy-making positions. The program is open only to current students. For entering students, education policy is a field in the doctoral program in public policy.

201–2 **Seminar: Current Issues in Education Policy** (3–3) Adams
Review of interdisciplinary literature relating to current education policy issues with emphasis on use of research and analysis in formulating and evaluating policy.

222 **Seminar: Topics in Education Policy** (3) Adams
Intensive interdisciplinary study of special topics in education policy.

290 **Advanced Studies in Education Policy** (3) Adams
Supervised interdisciplinary study and field work in a selected policy area.

399 **Dissertation Research** (arr.) Staff

## ENGLISH

University Professor A. Zwerdling
Professors P.H. Highfill, Jr., R.N. Ganz, Jr., J.H. Maddox, A.E. Claeyssens, Jr., G. Paster, J.A.A. Plotz, J.A. Quitslund
Associate Professors R.C. Rutledge, C.W. Sten *(Chair)*, G.R. Bozzini, R.L. Combs, D. McAleavey, O.A. Seavey, G. Carter
Associate Professorial Lecturer E.R. Garner
Assistant Professors A. Romines, M.V. Dow, M.S. Soltan, J. McGarry, K. Moreland, J.L. Porter

*Assistant Professorial Lecturers* T.G. Wallace, M.C. Markman, F. Elon, E.T. McClay, K.L. Levenback

*Lecturers* D. Scarboro, D. Carter, N. Whichard, J. Bolz, D.A. Bruno, J.C. Carlberg, C.E. Gamber, F. Moskowitz, P.A. Tackabury

*Jenny McKean Moore Visiting Lecturer in Creative Writing* R. McCann

*Bachelor of Arts with a major in American literature or English literature (field-of-study) or American literature, English literature, or literature in English (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Prerequisite courses—Engl 51–52 or 61–62 or 71–72. (Engl 51–52 is recommended for American literature majors.)

3. Required courses in related areas—(a) 12 semester hours of college-level foreign language study (Greek, Latin, Hebrew, French, German, Italian, Russian, or Spanish) or the equivalent, verified by a transcript or an examination administered by the appropriate department; (b) 6 semester hours of philosophy and/or religion; (c) 6 semester hours of history (English, American, European, or world). Courses in American history are recommended for American literature majors.

4. Required for the major:

(a) *Field-of-study major*—a major examination must be passed in either American or English literature at the end of the senior year. Although no set pattern of courses is prescribed, students are expected to engage themselves with writers and works from the whole chronological span of American literature or English literature. Proseminars in American Literature, Engl 199–200, and in English Literature, Engl 195–96, assist students in their preparation for the major examination. Students who wish to be candidates for graduation with Special Honors in either American or English literature must be in the field-of-study major.

(b) *Departmental major*—Engl 120 and 27 semester hours of second-group courses, of which no more than 6 hours may be taken in creative writing or composition. The 27 hours of second-group courses are as follows for the concentrations within the departmental major:

*American literature*—Engl 160; either Engl 161–62 or 163 and 167; 3 hours in English literature; and 15 additional hours of courses in the department, of which at least 9 must be in American literature.

*English literature*—Engl 194; Engl 112, 128, or 130; 3 hours in American literature; and 18 additional hours of courses in the department, of which at least 12 must be in English literature.

*Literature in English*—One course from each of the following categories:

1. Major authors: Chaucer, Shakespeare, Milton (Engl 112, 127, 128, or 130).
2. British and American literature before 1800 (Engl 112, 113, 125, 129, 130, 131, 132, 153, 155, or 160).
3. 19th-century British and American literature (Engl 133, 134, 135, 136, 154, 161, 162, 163, 167).
4. 20th-century British and American literature (Engl 137, 138, 139, 157, 158, 164, 165, 166, 168, 177, or 178).

With departmental approval, courses with appropriate subject matter may be taken in place of those specified above. Students take 15 additional hours of second-group courses, of which 6 may be earned by studying literature in a foreign language.

*Minor in literature in English*—15 hours of second-group literature courses, chosen in consultation with an advisor in the department.

*Minor in creative writing*—Engl 81 and 12 hours of second-group courses offered by the department, of which at least 9 must be in creative writing.

*Master of Arts in the field of American literature or Master of Arts in the field of English literature*—Prerequisite: a Bachelor of Arts degree with an undergraduate major in English or American literature, or 24 semester hours in English or American literature above the sophomore level.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) 24 semester hours of course work planned in consultation with

the department advisor; (2) Level One proficiency (translation of a passage with a dictionary) in an approved foreign language (French, German, Italian, Spanish, Greek, or Latin); (3) a Master's Comprehensive Examination in American or English literature; and (4) either a master's thesis (6 semester hours) on an approved topic, directed by a member of the department's graduate faculty, or, with the approval of the department's director of graduate studies, 12 additional semester hours of course work in lieu of the thesis. Students must maintain a quality-point index of at least 3.25.

*Doctor of Philosophy in the field of American literature or Doctor of Philosophy in the field of English literature*—Prerequisite: a Bachelor of Arts degree with an undergraduate major in English or American literature, or 24 semester hours in English or American literature above the sophomore level.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including satisfactory completion of (1) 72 semester hours of course work (48 for students with M.A. degrees in English) planned in consultation with the department advisor; (2) Level Two proficiency (translation of a passage without a dictionary) in an approved foreign language, or Level One proficiency (translation with a dictionary) in two approved foreign languages (French, German, Italian, Spanish, Greek, or Latin); (3) a qualifying examination in American Literature or English literature (to be taken as soon as feasible within the student's first 24 hours of course work), a period examination, a genre examination, and an examination on an approved major author or an alternative field; (4) a dissertation on an approved topic, directed by a member of the department's graduate faculty and approved by an examining committee.

Each student plans a program of studies in consultation with the department advisor and a committee of the graduate faculty. Students must maintain a quality-point index of at least 3.25. The fields for the period examination are English Medieval: beginnings to 1500; English Renaissance: 1500–1660; English 18th Century, 1660–1800; Early American: beginnings to 1815; 19th-Century English and/or American: 1800–1900; and 20th-Century English and/or American: 1900 to the present. The fields for the genre examination are drama, prose fiction, poetry, and criticism.

**Departmental prerequisite:** Engl 9 or 10 is prerequisite to all other courses in English. A 6-semester-hour course in literature, or equivalent, or permission of the instructor, is prerequisite for admission to all second-group courses in English except Engl 115, 160, 161, and 162.

Scores on the College Board English Composition Achievement Test, the Test of Standard Written English, or the English component of the American College Testing battery determine placement in Engl 9 or 10 and eligibility to waive the requirement, according to the following schedule:

| *Achievement Test* | | *TSWE* | | *ACT* | *Placement* |
|---|---|---|---|---|---|
| 650 and above | | | | | |
| 500–649 | or | 58 and above | or | 28 and above | Waives Engl 10 |
| 499 and below | or | 40–57 | or | 20–27 | Engl 10 |
| | or | 39 and below | or | 19 and below | Engl 9 |

The admission of international students to any English course is determined by the EFL Placement Test. Students should apply to the office of English for International Students to take this test (see Students from Foreign Institutions, under Admissions).

## EXPOSITORY WRITING

### First Group

9 **English Composition: Language as Communication** (3) Dow and Staff
Includes content of Engl 10; offers the advantage of more intensive work on analytical reading and on fluency and control in the writing process. Class meets five hours per week. Special fee, $25. (Fall and spring)

10 **English Composition: Language as Communication** (3) Dow and Staff
Practice of expository techniques in writing assignments ranging from the

autobiographical to the academic; emphasis on the writing process, with guidance in revising toward meaningful, engaging, idiomatic, and controlled discourse; analysis of such discourse through readings in professional writing and good student prose. (Fall and spring) Dow and Staff

11 **English Composition: Language and the Arts and Sciences** (3)
Study and practice of expository and argumentative techniques; emphasis on the sentence and diction and on logical thought by analysis of selected readings on the nature of language and the arts and sciences. Practice in effective, accurate, and honest use of secondary sources in a library research paper or a documented essay. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 11 cannot receive credit for Engl 12 or 13. (Fall and spring) Dow and Staff

12 **English Composition: Language in Literature** (3)
Study and practice of expository and argumentative techniques through critical writing; emphasis on stylistics in the sentence and diction by the study of literary genres and of the use of language in literature. Practice in effective, accurate, and honest use of secondary sources in a library research paper or a documented essay. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 12 cannot receive credit for Engl 11 or 13. (Fall and spring) Staff

13 **English Composition: Language and Ideas** (3)
Study and practice of expository and argumentative techniques; emphasis on the rhetorical problems raised by various intellectual disciplines and historical milieus. A substantial research paper is required. Prerequisite: Engl 9 or 10. To be taken only in conjunction with Hmn 1. Students who receive credit for Engl 13 cannot receive credit for Engl 11 or 12. (Fall and spring) Staff

20 **The Writing of Reports** (3)
Theory and practice in the writing of technical reports. Prerequisite: Engl 11 Offered off campus only.

100 **Written Communications in Accounting** (3) Bozzini and Staff
Analysis of communications by accountants and managers; frequent writing assignments, with emphasis on effective form and language in memoranda, letters, reports. Major in accountancy not required. Prerequisite: Engl 11 and junior status. Class size limited to 15 students. (Fall and spring)

**Second Group** Staff

101 **Advanced Writing** (3)
Individualized instruction and frequent conferences; writing projects vary with each student according to needs and interests. Emphasis on developing professional work habits. Prerequisite: Engl 11, 12, or 13, or written permission of instructor. Class size limited to 15 students. (Fall and spring) Staff

109 **Expository Writing for the Professions** (3)
Weekly exercises based on students' individual needs; particular attention given to problems in writing for technically sophisticated readers. Selected readings. Offered off campus only. Staff

110 **Writing in Engineering and the Sciences** (3)
Study of writings by engineers and scientists who have considered the implications of technology in the modern world. Concurrently, study and practice of the communication skills needed for careers in engineering and the sciences. Prerequisite: Engl 9 or 10 or EFL 50; junior, senior, or graduate status. Material fee, $5. (Spring) Staff

111 **Preparation for Peer Tutors in Writing** (3) Moreland
For undergraduates accepted as tutors in the Writing Center: study and practice of techniques for prewriting, writing, and revision; readings on collaborative learning, the composing process, composition theory, critical thinking, and the teaching of writing; observation and exercise in writing, peer criticism, and tutoring. (Fall)

**Third Group**

201 **The Teaching of Writing** (3) Dow
Brief historical account of the development of Western rhetoric; readings in current theories of the teaching of writing and in related fields of linguistics, philosophy, and cognitive psychology; exploration of the writing process, writing across the curriculum, and use of computers in writing and teaching; supervised experience in the classroom and Writing Laboratory; weekly writing assignments. Open to qualified seniors. (Fall)

## CREATIVE WRITING

With the exception of Engl 181, creative writing courses may not be repeated for credit.

**First Group**

81 **Introduction to Creative Writing** (3) McAleavey and Staff
*(Formerly Engl 102)*
An exploration of genres of creative writing (fiction, poetry, and/or playwriting). Basic problems and techniques; examples of modern approaches; weekly writing assignments; workshop and/or conference discussion of student writing. Prerequisite: Completion of English composition requirement. Limited to 18 students. Material fee, $5. (Fall and spring)

**Second Group**

103 **Intermediate Fiction I** (3) McGarry and Staff
The writing of fiction. Prerequisite: Engl 81 or equivalent and a two-semester literature survey (e.g., Engl 51–52 or equivalent). Limited to 15 students. Material fee, $5. (Fall)

104 **Intermediate Poetry I** (3) McAleavey and Staff
The writing of poetry. Prerequisite: Engl 81 or equivalent and a two-semester literature survey (e.g., Engl 51–52 or equivalent). Limited to 15 students. Material fee, $5. (Fall)

105 **Intermediate Playwriting I** (3) Claeyssens
Same as TrDa 105. The writing of plays. Prerequisite: Engl 81 or equivalent and a two-semester literature survey (e.g., Engl 51–52 or equivalent). Limited to 15 students. (Fall)

106 **Intermediate Fiction II** (3) McGarry, Claeyssens
The writing of fiction. Prerequisite: Engl 103 or equivalent. Limited to 15 students. Material fee, $5. (Spring)

107 **Intermediate Poetry II** (3) McAleavey and Staff
The writing of poetry. Prerequisite: Engl 104 or equivalent. Limited to 15 students. Material fee, $5. (Spring)

108 **Intermediate Playwriting II** (3) Claeyssens
Same as TrDa 108. The writing of plays. Prerequisite: Engl 105 or equivalent. Limited to 15 students. (Spring)

181 **Creative Writing Workshop** (3) TBA
Taught by the Jenny McKean Moore Visiting Lecturer in Creative Writing; open to undergraduates and graduate students. Prerequisite: Engl 81 or equivalent; consent of instructor. Writing sample to be submitted before registration. May be repeated for credit, if taught by a different instructor. Limited to 18 students. Material fee, $5. (Fall)

## ENGLISH AND AMERICAN LITERATURE

**First Group**

51–52 **Introduction to English Literature** (3–3) Quitslund and Staff
Representative works by major authors studied in their historical context;

discussion of recurrent themes and introduction to various types and forms of imaginative literature. Engl 51: Middle Ages through the 18th century. Engl 52: 19th and 20th centuries. (Academic year)

61 **Tragedy** (3) Carter, Paster
Modes of tragedy as developed in drama, nondramatic verse, and prose fiction in literature from ancient to modern times—Book of Job to Beckett.

62 **Comedy** (3) Carter, Rutledge
Modes of comedy as developed in drama, nondramatic verse, and prose fiction—Chaucer to Borges.

71–72 **Introduction to American Literature** (3–3) Ganz and Staff
Historical survey. Engl 71: From early American writing through Melville, Whitman, and Dickinson. Engl 72: From Twain, James, and Crane to the present. (Academic year)

**Second Group**

112 **Chaucer** (3) Staff
(Fall)

113 **Medieval English Literature—Exclusive of Chaucer** (3) Staff

115 **History of the English Language** (3) Staff
Development of the English language in a historical treatment of English grammar.

120 **Critical Methods** (3) Paster, Plotz, Romines
The topics and techniques of literary analysis, applied to English and American poetry, prose fiction, and drama. Attention to prosody, stylistic and structural analysis, narratology, and critical theory applied to specific literary texts.

123 **Approaches to Interpretation of Literary Texts** (3) Carter, Soltan
Historical study of poetics and interpretation, from the classical tradition (Aristotle, Sidney, Johnson) and Romanticism (Wordsworth, Coleridge, Shelley) to the modern era (Arnold, Eliot, Ortega y Gasset) and some contemporary critics (e.g., Bloom, Derrida).

125 **Elizabethan Verse and Prose** (3) Quitslund
Major authors from the late 16th century (e.g., Sidney, Spenser, Hooker, Nashe, Shakespeare, Donne), seen in relation to Continental Renaissance culture. (Spring)

127–28 **Shakespeare** (3–3) Highfill
Development of dramatic forms and recurrent themes. Engl 127: histories and comedies. Engl 128: tragedies. (Academic year)

129 **The Early 17th Century** (3) Quitslund
Poetry and prose to 1660, exclusive of Milton. (Fall)

130 **Milton** (3) Paster
Study of the major works in verse and prose, following the course of Milton's career. (Spring)

131–32 **English Literature, 1660–1800** (3–3) Highfill
Poetry and prose of major Baroque, Neoclassic, and early Romantic writers, examined in a context of social history and, occasionally, other arts. Content varies but always centers on major figures. Engl 131: Dryden, Swift, Pope, Thomson. Engl 132: Dr. Johnson and his circle, Gray, Cowper, Burns. (Academic year)

133–34 **The Romantic Movement** (3–3) Combs, Plotz
Major figures and topics in English and Continental romanticism. Engl 133: Blake, Wordsworth, Coleridge, Lamb, and others. Engl 134: Byron, Shelley, Keats, Hazlitt, DeQuincey, and others. (Engl 133—fall)

135–36 **Victorian Literature** (3–3) Carter
Engl 135: 1830–1865—E. Brontë, Dickens; Tennyson, Browning, Arnold; Darwin, Carlyle, Ruskin. Engl 136: 1865–1900—Eliot, Hardy, Conrad; Swinburne, the Rossettis, Morris; Pater, Wilde, the Nineties. (Engl 135—fall)

137–38 **The 20th Century** (3–3) Maddox, Soltan
Engl 137: Emergence of modernism in poetry, fiction, and criticism. Engl 138: Literature since the 1930s. (Engl 137—fall)

139 **20th-Century Irish Literature** (3) Maddox
The achievements of Irish writers between 1890 and 1939, with emphasis on Yeats and Joyce.

145 **Special Topics in English Literature** (3) Staff
Topics announced in the *Schedule of Classes*; may be repeated for credit provided the topic differs.

146 **Special Topics in Literature** (3) Staff
Topics announced in the *Schedule of Classes*; may be repeated for credit provided the topic differs.

153–54 **The English Novel** (3–3) Maddox, Soltan
Major novelists. Engl 153: 18th century. Engl 154: 19th century.

155–56 **The English Drama** (3–3) Paster, Highfill
Engl 155: Shakespeare's contemporaries. Engl 156: Historical survey, 1660 to present. (Engl 155—fall)

157 **20th-Century Drama** (3) Paster
Representative continental, English, and American plays of the 20th century.

160 **Early American Literature and Culture** (3) Seavey
The shaping of America's early literary and cultural traditions as shown by major writers of the Colonial and Early National periods: Bradstreet, Cotton Mather, Edwards, Franklin, Crevecoeur, and others. (Fall)

161 **American Romanticism** (3) Sten
The shaping of America's literary and cultural traditions as shown by major writers of the Romantic period: Poe, Emerson, Hawthorne, Melville, Thoreau, Whitman, Dickinson, and others. (Spring)

162 **American Realism** (3) Romines
The shaping of America's literary and cultural traditions as shown by major writers of the Realist period: Twain, James, Crane, Howells, Wharton, Chopin, Robinson, and others. (Fall)

163–64 **American Poetry** (3–3) Ganz, Combs, McAleavey
Close examination of major American poems. Engl 163: From the beginnings through the early 20th century: works by Bradstreet, Taylor, Poe, Emerson, Whitman, Dickinson, Robinson, Frost, and others. Engl 164: The 20th-century modernist poets: Stevens, Pound, Williams, Eliot, Ransom, Cummings, Crane, and others. (Academic year)

165–66 **American Drama** (3–3) Combs, Claevssens
Historical and critical study of significant plays and forms. Engl 165: The life and works of Eugene O'Neill and the dramatic techniques of Ibsen, Chekhov, and Strindberg that helped to shape 20th-century American drama; biographical and critical readings included. Engl 166: Significant and representative works of American theater, 1935–1982, including plays by Clifford Odets, Lillian Hellman, William Saroyan, Thornton Wilder, Arthur Miller, William Inge, Tennessee Williams, Eugene O'Neill, Carson McCullers, and Lorraine Hansberry, and outstanding examples of musical comedy. (Academic year)

167–68 **The American Novel** (3–3) Maddox, Seavey, Moreland
Historical and critical study of major works in the American novelistic tradition. Engl 167: From beginnings through the 19th century: Hawthorne, Melville, James, Twain, Dreiser, and others. Engl 168: The 20th century: Wharton, Cather, Anderson, Hemingway, Fitzgerald, Faulkner, Wright, R.P. Warren, Nabokov, and others. (Academic year)

170 **The Short Story** (3) Combs
An extensive survey of short fiction by a wide variety of writers of the 19th and 20th centuries, about half of them American, readings on the art of the short story by writers and literary critics included. (Spring)

171 **Major Authors of Literature in English** (3) Staff
In-depth studies of two or three authors (of British, American, or other

nationality) who have written in English. Topics announced in the Schedule of Classes; may be repeated for credit provided the topic differs.

172 **Studies in Literary Movements** (3) Staff
Varying topics that concern the related achievements of a group of authors. Topics announced in the *Schedule of Classes*; may be repeated for credit provided the topic differs.

174 **Afro-American Literature** (3) Staff
Same as AmCv 174. Study of texts representing the experiences of black Americans and the ideas and social forces that have shaped their lives and writings.

175 **Special Topics in American Literature** (3) Staff
Topics announced in the *Schedule of Classes*; may be repeated for credit provided the topic differs.

177–78 **Contemporary American Literature** (3–3) Ganz, Claeyssens, Zwordling
Major and representative works, 1946–1980. Engl 177: poetry, fiction, and nonfiction by Flannery O'Connor, Ginsberg, Kerouac, Rich, Lowell, Plath, Mailer, Roethke, Baraka, Berryman, Ashbery, and others. Engl 178: essay, short story, and novel: Robert Penn Warren, J.D. Salinger, James Agee, E.B. White, Cheever, Nabokov, Welty, Wilder, Tillie Olsen, Bellow, John McPhee, and others. (Academic year)

182 **A Writer's Perspective on Literature** (3) (Spring)
Study of a literary topic, from the point of view of the Jenny McKean Moore Visiting Lecturer in Creative Writing. May be repeated for credit. Kennedy

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Staff
Same as Fren/Ger/Hist/Rel 183 and Art 187.

194 **History of English Literature** (3) (Spring)
A historical survey of the processes by which literature was produced in the British Isles from Old English beginnings up to 1800. Paster, Quitslund

195–96 **Proseminar in English Literature** (3–3)
For field-of-study majors in English literature. Themes and concerns basic to the English literary tradition that draw connections between diverse works from the Old English period to recent times. (Academic year)

197 **Independent Study** (3) Quitslund and Staff
For exceptional students whose academic objectives cannot be accommodated in regular courses. Students must obtain the Chairman's approval and arrange for supervision by an appropriate member of the department. (Fall and spring)

198 **Senior Honors Thesis** (3) Ganz and Staff
Independent study. Under the guidance of an instructor, the student writes a thesis on an approved topic. Open to qualified seniors in the field-of-study major in English literature. (Fall and spring)

199–200 **Proseminar in American Literature** (3–3) Staff
For field-of-study majors in American literature. Readings, conferences, and group discussions. (Academic year)

**Third Group**

212 **Studies in Chaucer** (3) Staff

213 **Old English** (3) Staff
Old English grammar and readings.

214 **Beowulf** (3) Staff
Prerequisite: Engl 213 or equivalent.

219 **Introduction to Graduate Studies in English** (3) Quitslund
For all candidates for M.A. and Ph.D. degrees in American or English literature. Introduction to the scope and methods of advanced literary studies; readings, research problems, and instruction designed to acquaint students with available aids to research. (Fall)

223 **Contemporary Literary Theory** (3) Carter, Solts
Inquiry into the nature of literary texts and interpretive strategies. Close

readings of texts (by Barthes, Derrida, de Man, Bloom, Eagleton, Fish, Kermode, and others) exemplifying the ferment of recent theoretical writing about literature. (Fall)

225–26 **Studies in Renaissance Verse and Prose** (3–3) Quitslund, Paster
Investigation of broad topics central to literature of the Renaissance (e.g., development of the lyric, heroic poetry and romance, literature and the court), with primary attention to English texts and some attention to classical and continental contexts.

227–28 **Studies in Shakespeare and his Contemporaries** (3–3) Paster
Specialized studies of Elizabethan and Jacobean drama, considered in its cultural context, with emphasis on Shakespeare.

230 **Studies in Milton** (3) Staff
(Fall)

231–32 **Studies in English Literature, 1660–1780** (3–3) Highfill

233–34 **Studies in the Romantic Movement** (3–3) Plotz
Intensive and contextual consideration of English Romantic writers, themes, genres. Topics will vary, e.g., Byron and Romantic irony, Wordsworth and Keats, defining Romanticism, Romanticism and childhood.

235 **Studies in Victorian Poetry** (3) Carter
Investigation of various ways in which the major Victorian poets depended upon and departed from the achievements of precursors among the Romantics and earlier poets.

236 **Studies in Victorian Prose** (3) Carter
Study of seminal writings by such authors as Carlyle, Mill, Arnold, Newman, Darwin, and Pater, with attention to both their intrinsic merit and the light they throw on Victorian poetry and fiction.

237–38 **Studies in 20th-Century Literature** (3–3) Zwerdling, Soltan
(Engl 238—fall)

253–54 **Seminar: The English Novel** (3–3) Maddox, Zwerdling, Soltan
Investigation of various topics concerning the development of the genre, 18th to 20th centuries: e.g., themes and form in 18th-century fiction; emergence of circumstantial realism; mentors and lovers in 19th-century novels: the revolution in fictional forms circa 1900.

256 **Studies in Dramatic and Theatrical History** (3) Highfill
Studies in drama and theater of the Restoration and 18th century. Held at the Folger Shakespeare Library.

263–64 **Seminar: American Poetry** (3–3) Ganz, McAleavey
American poets and critics of poetry.

267–68 **Seminar: American Fiction** (3–3) Sten, Maddox
Investigation of various topics pertinent to the American novel and short fiction, primarily of the 20th century (e.g., Faulkner, experimental fiction, writers of the Midwest).

281–82 **Seminar: Early American Literature** (3–3) Seavey
(Engl 282—spring)

283–84 **Seminar: American Romanticism** (3–3) Sten
Engl 283: American Romance writers: Melville, Hawthorne, Poe, and others.
Engl 284: American Transcendentalist poetry: Emerson, Whitman, Dickinson, and others.

285–86 **Seminar: American Realism, 1865–1915** (3–3) Romines, Sten
Realistic fiction in various contexts—literary, intellectual, cultural. Major authors, such as James, Twain, Howells, and Wharton, are included, along with other writers, such as Jewett, Chopin, Norris, and Adams. Topics vary: e.g., the autobiographical impulse, influence of French fiction and criticism, the importance of "place," the significance of gender.

287 **O'Neill and Modern American Drama** (3) Combs
Study of the career of Eugene O'Neill and his impact on the development of modern theater in America; readings in biography and criticism. (Fall)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

**Fourth Group**

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301–14. Students wishing to register for these courses should consult the chairman of the English Department.

301–14 **Folger Institute Seminars** (3 each) Staff
Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## ENGLISH AS A FOREIGN LANGUAGE

*Associate Professor* G.R. Bozzini
*Assistant Professors* F.C. Reid, S.M. Wright (Director), E. Echeverria, M. Kirkland, C. Meloni, S. Thompson
*Instructors* A.J.B. Covarrubias, J.K. Donaldson, Jr., S.M. Spolarich, P. Connerton, M.E. Evans, C.L. Iacobelli, M.A.P. Saunders, M.B. Bandas, C.J. Demnitz, P.N. Edmondson

This comprehensive program in English as a foreign language is designed for persons enrolled or planning to enroll in University credit programs, for members of Washington's international community, and for other individuals who wish to improve their command of English through an intensive or semi-intensive study program. International students entering the program must take the EFL Placement Test before registering for any EFL course. English for International Students offers several noncredit special courses in addition to those listed below. For further information, contact Shirley M. Wright, Program Director, English for International Students, George Washington University, Academic Center T–604, Washington, D.C. 20052.

**Note:** In special cases and with the approval of the English for International Students program, component parts of EFL 15, 20, 30, 40, and 45 can be taken separately. Tuition rates and laboratory fees are charged accordingly.

**First Group**

15 **Intensive Basic English** (0) Covarrubias, Echeverria
Introduction to basic grammar, vocabulary, and composition. Development of reading, speaking, and listening skills. Twenty class hours per week. Students registered in EFL 15 will not be permitted to register for any other academic course. Tuition is charged at the rate of seven semester hours; laboratory fee, $70.

20 **Intensive Lower-Intermediate English** (0) Evans, Iacobelli
Continued study of basic grammar. Continued practice in speaking, listening, reading, vocabulary, and composition. Emphasis on integration of skills. Twenty class hours per week. Students registered in EFL 20 will not be permitted to register for any other academic course. Tuition is charged at the rate of seven semester hours; laboratory fee, $70.

30 **Intensive Intermediate English** (0) Connerton, Demnitz
Continued study of grammar with emphasis on complex structures. Further practice in reading, vocabulary, oral communication, and composition. Introduction to academic lectures and note-taking practice. Twenty class hours per week. Students registered in EFL 30 will not be permitted to take additional academic work without approval of the advisor. Tuition is charged at the rate of seven semester hours; laboratory fee, $35.

40 **Intensive Higher-Intermediate English** (0) Bandas, Evans, Kirkland, Saunders, Spolarich

Emphasis on skills needed in academic course work. Continued practice in complex grammar, oral communication, vocabulary, note-taking skills, and composition. Practice in reading strategies for unadapted material. Introduction to basic research techniques. Twenty class hours per week. Students registered in EFL 40 will not be permitted to take additional academic work without approval of the advisor. Sections are offered with general academic and technical emphasis. Tuition is charged at the rate of seven semester hours; laboratory fee, $35.

45 **Semi-Intensive Advanced English** (0) Edmondson, Thompson

Emphasis on skills needed in academic course work. Selective review of grammar. Practice in reading university-level materials, speaking, and study skills. Continued practice in composition and research techniques. Eight class hours per week. Tuition is charged at the rate of five semester hours.

50 **English Composition/Research Methods for International Students** (3) Donaldson, Meloni

Composition and library research methods course for students who demonstrate high proficiency in English. Four class hours per week. This course can be taken by international students in lieu of Engl 9 or 10. Sections are offered with general academic and technical emphasis. Special fee, $25.

60 **Advanced Oral Communication** (3) Echeverria

For students who demonstrate high proficiency in English and wish to improve their formal speaking and listening skills in such areas as interviewing, preparing and delivering informative and persuasive speeches, leading and participating in small-group discussions, and taking stands on controversial issues. Instructional resources include professional speeches and topics from recent newspaper and magazine articles and interviews. Four class hours per week. Special fee, $25.

61 **American Language and Culture** (3) Echeverria, Covarrubias

For students who demonstrate high proficiency in English. Advanced English language skills taught through a study of currents in American thought, culture, and civilization. Discussions are based on selected texts and periodical literature. Topics are highlighted by films, guest lecturers, and cultural activities. Four class hours per week. Special fee, $25.

## ENVIRONMENTAL AND RESOURCE POLICY—GRADUATE PROGRAM

**Committee on Environmental and Resource Policy**

H.C. Merchant (*Academic Director*), J. Millar, T. Vandermer, A. Viterito

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Master of Arts in the field of public policy with a concentration in environmental and resource policy. The program is directed by the Committee on Environmental and Resource Policy and draws upon faculty and relevant courses from the various departments within the University.

The Environmental and Resource Policy Program presents in its core requirement a graduate-level examination of the specific areas that affect decisions made in the broad area of environmental and resource policy. This material includes the analytic tools required for decisions leading to effective policy regarding the environment and natural resources. In addition to mastering the core material, a student is also expected to develop specific competence in an area of particular interest by choosing an approved elective field. Prospective candidates should consult with the director of the Environmental and Resource Policy Program.

*Master of Arts in the field of public policy with a concentration in environmental and resource policy.*—Prerequisite: a bachelor's degree with a *B* average (or equivalent) in a social science, natural science, or other relevant area from an accredited college or university and an introductory course in statistics. Presentation of Graduate Record Examination scores is strongly recommended.

Required:
(a) The general requirements stated under the Graduate School of Arts and Sciences.
(b) Twenty-six hours of core courses selected from the following (students whose backgrounds include some of these courses may substitute additional courses in the elective field): BiSc 208, 243; Econ 217, 237; EnHe 240; E&RP 210; PSc 203; Psyc 244; Stat 183 (or other appropriate statistical techniques course).
(c) Twelve hours of courses selected from those listed in one of the following elective fields. (Students are required to meet departmental prerequisites before enrolling in courses; check the conditions stated under the Graduate School of Arts and Sciences for receiving graduate credit for advanced undergraduate courses.)
Earth Sciences: Geog 107, 108, 136, 137, 219; Geol 105, 122, 128, 131, 175
Ecology: BiSc 140, 141, 142, 143, 144, 150, 167, 206, 242; Geog 290
Energy: Econ 235; EAd 221 (Environmental Management); Geog 134; PSc 222, 223, 252, 288, 289 (the School of Engineering and Applied Science offers many technical courses relevant to this area, and some may be included in this program)
Resource Management: Econ 161, 162; Geog 132, 133, 222, 230, 290; Soc 127
(d) Comprehensive Project—Taken at the completion of the student's program, the comprehensive project is the investigation of a specific problem in environmental and resource policy and the development of a proposed solution in a manner that integrates the core curriculum with the course work in the elective field. Staff

210 **Seminar in Environmental and Resource Policy** (3)
Limited to candidates in the Environmental and Resource Policy program; capstone course integrating the core and elective areas of the program. Provides practical experience in decision making and serves as preparation for the comprehensive project.

## ENVIRONMENTAL SCIENCE—GRADUATE PROGRAM

**Academic Committee:** H. Merchant (*Director*), J. Millar, T. Vandermer, A. Viterito

The Graduate School of Arts and Sciences offers a multidisciplinary program leading to the degree of Master of Science in the field of environmental science. The curriculum is designed to provide an understanding of the environment with an emphasis on problems of the work place.

*Master of Science in the field of environmental science*—Prerequisite: a bachelor's degree with a *B* average from an accredited college or University and an introductory course in statistics.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. The required curriculum is Chem 205; Econ 217, 237; EnHe 201, 240, 256, 270, 301; PSc 224; Stat 127. An additional 9 credits are selected in consultation with the advisor. Each student must pass a Master's Comprehensive Examination.

## ENVIRONMENTAL HEALTH

201 **Introduction to Epidemiology** (3)
Principles and methodology of epidemiology and biostatistics. Ecological approach to health and disease, including parasitology and mycology.

240 **Environmental Impact Statement Procedures and Environmental Law** (3)
The rationale for environmental impact statements from the viewpoint of the nature and origins of environmental concerns. Government agencies responsible for environmental impact statements; current statutes and regulations pertaining to the environment.

256 **Introduction to Environmental Health** (3)
Organizations, functions, current practices, and regulations at all levels to control the environment. Economic impact upon society and industry of carrying out control and preventive practices.

270 **Industrial Hygiene** (3)
Industrial health hazards: chemical exposure to toxic dusts, metallic fumes and vapors, gases, and organic compounds; physical hazards such as high- and low-temperature biological effects, radiation (electromagnetic, ultraviolet, ionizing), illumination, sound, pressure, and particulate pollution; prevention and control of industrial health hazards.

301 **Applied Epidemiology and Environmental Health** (3)
Lectures, seminars, and case studies. Epidemiological solutions to health problems of the community.

## ENVIRONMENTAL STUDIES

**Committee on Environmental Studies**
H. Merchant *(Chair)*, W.C. Parke, W.E. Schmidt, A. Viterito, A.M. Yezer

Columbian College of Arts and Sciences offers interdepartmental programs in environmental studies leading to the degree of Bachelor of Arts or Bachelor of Science. By emphasizing the social sciences, the program leading to the degree of Bachelor of Arts is designed to serve the student whose participation in the environmental decision-making process involves integrating information of a less technical nature. The program leading to the degree of Bachelor of Science prepares a student for a role in environmental decision making that involves the interpretation and use of technical information.

*Bachelor of Arts with a major in environmental studies (departmental)*—The following requirements must be fulfilled:
1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses (qualified students may substitute advanced courses with departmental permission, in order to include more elective courses in their program):
(a) Statistics—Stat 91.
(b) Natural sciences—6–8 semester hours selected from BiSc 3–4, 11–12; Chem 11–12; Geol 1–2; or Phys 1, 2, 5, 6. BiSc 3–4 must be passed with a grade of *A* or *B* to be accepted toward fulfilling the introductory natural science requirement.
(c) Social sciences—Econ 1–2, plus 6 semester hours selected from Anth 1–2; Geog 1, 2, 3; PSc 1, 2; Psyc 1, 5–6; or Soc 1, 2.
3. Required courses for the major (51 semester hours):
(a) BiSc 140; Econ 136, Geog 132.
(b) Eight semester hours selected from BiSc 101, 102, 103, 105, 107, 108, 109, 110, 111, 120, 123, 124, 125, 127, 128, 135, 141, 142, 143, 144, 145, 150, 166, 167, 168, 169, 185, 208, 242, 243; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 105, 122, 125, 128, 141, 163; Phys 14, 15, 16, 127–28.
(c) 24 semester hours in courses selected from no more than two departments in the following—Anth 150, 151, 152, 171, 186, 187, 188, 263, 267, 273; Econ 101, 102, 105, 157, 158, 161, 199, 237, Envr 159–60, 161; Geog 106, 107, 108, 110, 127, 134, 135, 136, 137, 140, 143, 145, 222; PSc 104, 111, 112, 117, 118, 120, 122, 124, 129; Psyc 104, 144, 151, 156; Soc 120, 126, 127, 130, 143, 181.
(d) Envr 151–52, 157.

*Bachelor of Science with a major in environmental studies (departmental)*—The following requirements must be fulfilled.
1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses (qualified students may substitute advanced courses, with departmental permission, in order to include more elective courses in their program):
(a) Statistics—Stat 91.
(b) Natural sciences—12–18 semester hours selected from BiSc 11–12; Chem 11–12; Geol 1–2; Phys 1, 2, 5, 6. Either BiSc 11–12 or Chem 11–12 must be selected.
(c) Social sciences—Econ 1–2, plus 6 semester hours selected from Anth 1–2; Geog 1, 2, 3; PSc 1, 2; Psyc 1, 5–6; Soc 1, 2.
3. Required courses for the major (51 semester hours):
(a) BiSc 140; Econ 136, Geog 132.
(b) 23 semester hours selected from BiSc 101, 102, 103, 105, 107, 108, 109, 110, 111, 120, 123, 124, 125, 127, 128, 135, 141, 142, 143, 144, 145, 150, 166, 167, 168, 169, 185,

208, 242, 243; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 105, 122, 125, 128, 141, 163; Phys 14, 15, 16, 127–28.

(c) 9 semester hours selected from Anth 150, 151, 152, 171, 186, 187, 188, 263, 267, 273; Econ 101, 102, 105, 157, 158, 161, 199, 237; Geog 106, 107, 108, 110, 127, 134, 135, 136, 137, 140, 143, 145, 222; PSc 104, 111, 112, 117, 118, 120, 122, 124, 129; Psyc 104, 144, 151, 156; Soc 120, 126, 127, 130, 143, 181.

(d) Envr 151–52, 157.

The science and social science courses listed under 3(b) and 3(c) above must be taken in not more than *three* departments. Not more than 6 hours of service–learning courses may count toward fulfilling requirements of the major.

In choosing elective courses for both the Bachelor of Arts and Bachelor of Science degree programs, students are reminded that, unless a Secondary Field of Study is chosen, permission of the Dean of Columbian College of Arts and Sciences and the Committee on Environmental Studies is necessary to take courses not offered by Columbian College of Arts and Sciences, and a maximum of 9 semester hours of such courses may be taken. The following may be of interest to the environmental studies major: BAd 101, 171, 201, 203; CE 194, 197 (see the School of Engineering and Applied Science *Bulletin*); U&RP 153, 201. The permission of the instructor, the department chairman, and the Dean of the School of Government and Business Administration is necessary to take graduate courses (numbered 201 and above) in that School.

151–52 **Senior Seminar in Environmental Studies** (3–3)
Limited to majors in environmental studies. Directed reading and discussion of contemporary environmental problems.

157 **Introduction to Environmental Law** (3)
An introduction to selected pieces of major environmental legislation. The role of the courts and bureaucracy in implementing and interpreting legislation. Impact on decision making. Designed for students with no training in law.

159–60 **Field Experience** (3–3)
Open to juniors and seniors majoring in environmental studies. Students will spend at least eight hours per week in a political, technical, legal, or special interest organization working on environmental questions.

161 **Environmental Policy Internship** (3 or 6)
For students interested in environmental policy and decision making at the national level. The course consists of an internship with a federal agency or public interest group concerned with environmental affairs, a weekly seminar based on directed readings, guest speaker presentations, and a major term paper. (Summer)

## FORENSIC SCIENCES—GRADUATE PROGRAMS

*Professors* T.P. Perros, J.E. Starrs, T.F. Courtless, Jr., C. O'Rear *(Chair)*
*Adjunct Professor* C.G. McWright
*Professorial Lecturers* L.R. Goldbaum, E.G. Howe, C.E. Bohn, F.P. Pantuso, K.E. Melace
*Associate Professors* N.T. Lappas, W.F. Rowe
*Associate Professorial Lecturers* J.L. Melnick, B.W. Given, W.A. Bayse, M.M. Levy, S.S. Lorigo, R.E. Easton
*Assistant Professorial Lecturers* H.J. Volzer, L. O'Grady

*Master of Forensic Sciences*—Prerequisite: a bachelor's degree from an accredited institution of higher learning and academic or professional experience in the behavioral, biological, or physical sciences or in law, medicine, or law enforcement.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Students must complete 36 semester hours of approved course work; students approved for a thesis must complete 30 semester hours of course work plus a thesis (equivalent to 6 semester hours). ForS 220, 221, 224, and 225 are required of all students; ForS 224 may be waived for students having an LL.B. or J.D. degree from an accredited law school. The following are also required: (1) 9 hours selected from ForS 201, 202, 203, 204, and 205; (2) 9 hours selected from ForS 214, 260, 261, 265, and 269; (3) [illegible]

remaining semester hours must be selected in consultation with the advisor from the behavioral sciences, law, management science, or forensic sciences. It is strongly recommended that students participate in the forensic sciences practicum. All candidates are required to pass a written Master's Comprehensive Examination.

*Master of Science in the field of chemical toxicology*—Prerequisite: completion of the first three years of the combined B.S./M.S. program in chemical toxicology (see Chemistry Department) or its equivalent. Courses may be required to remove academic deficiencies.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The following courses are required: Bioc 221–22; Phyl 191; Phar 203; ForS 240, 245, and 242 or 270; two courses selected from ForS 246, 248, 249, 269; ForS 299–300 or Chem 299–300. Chem 134, 141–42, and Stat 127 will be required of students who have not had these courses or their equivalent. All candidates are required to pass a Master's Comprehensive Examination.

*Master of Science in Forensic Science*—Prerequisite: a bachelor's degree in the biological or physical sciences from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 30 semester hours of course work, plus a thesis (equivalent to 6 semester hours). Individualized programs of study will be developed to meet the career objectives of each student. Students may specialize in forensic chemistry, toxicology, or serology. Each such program of study must include ForS 224 and 225. All candidates must also participate in the departmental seminar each semester. The remaining semester hours must be selected from approved courses in the forensic sciences, biological and physical sciences, management science, law, or basic medical sciences. It is strongly recommended that students participate in the forensic sciences practicum. All candidates are required to pass a written Master's Comprehensive Examination.

*Master of Arts in the field of criminal justice*—Prerequisite: a bachelor's degree from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of approved course work in the forensic sciences, law, criminology, management science, sociology, and psychology. ForS 214, 220, 221, 224, 225, 228, 265, 266, 274, 290, and Soc 259, 261 are recommended. All candidates are required to pass a written Master's Comprehensive Examination. It is strongly recommended that students participate in the forensic sciences practicum.

*Master of Arts in the field of criminal justice with a concentration in crime in commerce*—Prerequisite: a bachelor's degree from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of approved course work drawing upon the forensic sciences, law, accounting, computer science, investigative techniques, and management. ForS 203, 224, 225, 229, 232, 233, 234, 235, 251, 267, 274, and Stat 197 are recommended. All candidates are required to pass a written Master's Comprehensive Examination. It is strongly recommended that students participate in the forensic sciences practicum.

*Master of Arts in the field of criminal justice with a concentration in security management*—Prerequisite: a bachelor's degree from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Students must complete 36 semester hours of approved course work; students approved for a thesis must complete 30 semester hours of course work plus a thesis (equivalent to 6 semester hours). The program of study consists of course work drawing from the forensic sciences, law, criminology, management science, investigative techniques, and security management. Courses are selected from ForS 214, 224, 229, 232, 233, 234, 252, 254, 256, 257, 266, 267, 290, 295, Soc 263. All candidates are required to pass a written Master's Comprehensive Examination. It is strongly recommended that students participate in the security management practicum.

The interdisciplinary programs leading to the degrees of Master of Arts, Master of Forensic Sciences, and Master of Science in Forensic Science may include course work from the School of Government and Business Administration, the National Law Center, the School of Medicine and Health Sciences, and graduate course work in the behavioral, biological, and physical science departments of the University. Students work closely with their advisors in setting up a program that meets their interests, needs, and background knowledge. The Department of Forensic Sciences is affiliated with the Armed Forces Institute of Pathology and with the Council of Higher Education, Commonwealth of Virginia, in programs of mutual exchange of students, courses, and facilities. For further information, contact the Department of Forensic Sciences.

A research field in forensic chemistry is available in the Ph.D. program in the Chemistry Department.

201 **Forensic Serology I** (3) Lappas
Principles of the forensic analysis of blood and other biological materials. Specific procedures and techniques used in forensic serology. Laboratory exercises.

202 **Instrumental Analysis** (3) Rowe
Principles and application of various instrumental methods to the examination of criminal evidence, including chromatographic and spectrophotometric techniques and mass spectrometry. Laboratory exercises.

203 **Examination of Questioned Documents** (3) Bohn
Theory and principles of handwriting and handprinting, duplicating processes, paper manufacture and fiber analysis; studies of paper and methods of examining questioned documents. Laboratory exercises.

204 **Firearms and Tool-mark Identification** (3) Rowe
Methods for identifying firearms, cartridge casings, tool marks, tire marks and footprints. Laboratory exercises.

205 **Personal Identification** (3) Given, Rowe
Methods of personal identification based on sketches, fingerprints, voiceprints, odontology, and study of skeletal remains.

214 **Forensic Psychiatry** (3) Howe
Introduction to the constructs of dynamic psychiatry, psychiatric treatment and the nomenclature of mental disorders. Consideration of expert testimony, direct examination, and cross-examination in hospitalization and criminal cases.

220 **Physical Aspects of Forensic Sciences** (3) O'Rear, Rowe
Survey of forensic physical sciences: fingerprints, firearm and toolmark examinations, document examinations, and examinations of trace evidence such as glass, soil, paint, hairs, and fibers; crime scene investigations; qualifications and preparation of expert witnesses; operation and functioning of the forensic science laboratory.

221 **Biological Aspects of Forensic Sciences** (3) Lappas, Rowe
Principles of forensic pathology, serology, and toxicology. The role of the forensic laboratory in the identification of human remains; determination of the time, cause, and manner of death; partial individualization of biological materials; and the detection of drugs in biological materials.

224 **Criminal Law I** (3) Melnick, Melson, O'Grady
Principles of criminal law and procedure, preparation and presentation of evidence, examination of witnesses, and methods of legal research.

225 **Criminal Law II: Evidence** (3) Melson, Melnick, Volan
Procedural rules affecting the collection and use of physical evidence. Emphasis on court opinions defining the rules of search and seizure and admissibility of evidence. Prerequisite: ForS 224.

227 **Criminal Law III: Procedure** (3) O'Grady, Volan
Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, postconviction procedures. Prerequisite: ForS 224.

229 **Criminal Law IV: Contracts** (3) Easton
Concepts and principles of law encountered in commercial activities: contracts, sales, negotiable instruments, and bankruptcy. Emphasis on recognition of deceptive contracting practices. Statutes and government regulation governing contracts.

232 **Crime in Commerce I: Accounting** (3) Levy, Lorigo
Principles of accounting; abuse and misuse of accounting procedures; use of accounting in the investigation of commercial crime.

233 **Crime in Commerce II: Procurement and Supply** (3) Levy, Lorigo
Governmental and private-sector procurement procedures; techniques of inventory management; abuse of procurement procedures and illicit diversion of supplies.

234 **Crime in Commerce III: Information Systems** (3) Bayse
Principles of management information systems; security of information systems and facilities; compromising of information systems.

235 **Crime in Commerce IV: Conspiracy** (3) Levy
Legal definition of conspiracy; quantum of proof; use of investigative techniques to establish the existence of criminal conspiracies.

240 **Principles of Toxicology** (4) Lappas
Concepts of toxicology, including its historical development and modern applications, drug disposition, mechanisms of toxicity; factors that influence toxicity and toxicity evaluation. Prerequisite: Phar 203 or permission of instructor.

242 **Chemistry of Organic Medicinal Agents** (3) O'Rear
A correlated study of the composition, constitution, physical and chemical properties, and pharmaceutical uses of organic medicinal agents. Included are discussions of the heterocyclic chemistry of these agents.

245 **Analytical Toxicology** (4) Lappas
A study of qualitative and quantitative principles and procedures used in the detection, identification, isolation, purification, and potency determination of drugs. Laboratory.

246 **Environmental Toxicology** (3) Lappas
A study of the chemical substances to which humans are unintentionally exposed. Emphasis will be placed on pesticides, food additives, and air pollutants.

248 **Clinical Toxicology** (3) Staff
A study of the adverse effects caused by or related to the use of drugs. The signs and symptoms, diagnoses, and treatments will be emphasized.

249 **Industrial Toxicology** (3) Staff
A study of the potential hazards encountered by workers as a result of their exposure to raw materials, intermediates, and finished products. The types of exposure and methods of predicting and preventing toxic exposure will be emphasized.

250 **Interdisciplinary Aspects of Forensic Science** (3) O'Rear
Scientific and legal aspects of current concepts. Includes qualification as an expert witness, chain of custody, impact of testimony on the jury, admissibility of evidence, class evidence vs. individualized evidence, and search and seizure. Prerequisite: ForS 224.

251 **Moot Court** (3) Rowe
Students prepare and present direct testimony and are cross-examined by an experienced trial attorney in simulated courtroom setting. Class discussions of problems, techniques. Lectures on discovery, admissibility of scientific evidence, chain of custody, use of notes, etc. Prerequisite: ForS 224.

252 **Topics in Security Management** (3) Staff
The broad spectrum of factors that shape modern security management: technology, government regulations and policies, corporate matters, information systems, legal principles, international programs, congressional committees, industrial organizations, associations. Potential areas of research and study.

254 **Selected Topics in the Forensic Sciences** (3) O'Rear
Current issues in research, investigation, and law.

255 **Security Management I** (3) Staff
Risk assessment and management, redundant security systems, cost–benefit analysis. Administration of personal, industrial, and physical plant security. Analysis of factors that facilitate decision making in security problems.

256 **Security Management II** (3) Staff
Hostage situations, preparation of high-risk employees and spouses for hostage incidents, management of post-incident situations, hostage rescue groups.

257 **Management of Security Organizations** (3) Pantuso
Theories of management, with emphasis on leadership and interaction of individuals, groups, managers, and the organization as a whole. Discussions centered on organizations with security responsibilities, including government agencies, corporate entities, and the military.

260 **Principles of Forensic Medicine** (3) Clark
Anatomy and physiology of the human body, with emphasis on understanding the processes underlying traumatic and unexpected deaths encountered in forensic pathology. Bone growth and repair as it relates to child abuse; structure and functions of the heart as related to sudden death, and anatomic area of the brain prone to hemorrhagic lesions following trauma.

261 **Principles of Forensic Pathology** (3) Clark
Terminology and scientific techniques used in medico-legal investigations; sudden or unexpected deaths, homicides, suicides, accidental deaths, and trauma.

265 **Drugs of Abuse** (3) Lappas, O'Rear
Chemical, pharmacological, toxicological, and pathological characteristics of commonly abused drugs, including ethanol, barbiturates, narcotics, stimulants, and hallucinogens. Primarily for M.A. degree candidates; open to others with permission of instructor.

266 **Seminar: Modern Trends in Criminal Justice** (3) O'Rear, Courtless
Recent advances in criminal justice. Discussions incorporate several disciplines, including science, law, management, social sciences, and psychology.

267 **Seminar: Crime in Commerce** (3) Levy, Lorigo
Interdisciplinary course in current problems in the investigation and prosecution of commercial offenses.

268 **Photography in the Forensic Sciences** (3) Clark
Basic use of forensic photography, including selection and use of equipment; photographs as evidence, close-up work, and common misconceptions. Laboratory fee, $35.

269 **Forensic Toxicology I** (3) Lappas, Stajic
Relevant underlying biological, chemical, and pharmacological principles of forensic toxicology

270 **Medicinal Chemistry** (3) O'Rear
Theory and principles of classification, synthesis, and structure activity relationships of drugs. Discussion of the complex chemical events that take place between administration of a drug and its action on the user, with emphasis on drugs of abuse.

271 **Forensic Serology II** (3) Lappas, Mudd
Methods in forensic serology. Laboratory examinations and classifications of dried blood and other biological materials. Independent laboratory projects. Laboratory fee, $35. Prerequisite: ForS 201 or permission of instructor

272 **Forensic Toxicology II** (3) Lappas, Stajic
Lectures, student seminars, laboratory exercises, and projects dealing with topics of current interest in forensic toxicology. Prerequisite: ForS 245 or 25[illegible] or permission of instructor. Laboratory fee, $35.

273 **Forensic Chemistry I** (3) Rear
Examination of glass, soils, hairs, and fibers. Laboratory exercises inc[illegible] refractive index measurements using immersion methods; polarized [illegible]

observations of minerals, hairs, and fibers; elemental analysis of glass and soil by spectroscopic methods; x-ray diffraction analysis of minerals; and classical chemical and physical methods of analysis. Prerequisite: ForS 202 or permission of instructor. Laboratory fee, $35.

274 **Management of Criminal Justice Organizations** (3) O'Rear
Theories of management with emphasis on leadership. Interaction of individuals, groups, managers, and the organization as a whole. Discussions centered on the criminal justice system.

280 **Forensic Chemistry II** (3) Rowe
Examination of arson accelerants, textile fibers, plastics, and paints. Laboratory exercises include infrared spectrophotometry and pyrolysis—gas–liquid chromatography of polymeric materials, as well as classical chemical and physical methods of analysis. Prerequisite: ForS 273. Laboratory fee, $35.

290 **Research in Criminal Justice** (3) Courtless
An examination of the role and process of research as it serves the criminal justice systems. Presentations and discussions of the literature with emphasis on the use of research and analysis in formulating and evaluating criminal justice policy.

295 **Research** (arr.) Staff
Open to qualified master's degree students. Research on problems approved by the department chairman or academic advisor, under the supervision of an appropriate staff member.

297 **Security Management Practicum** (1) O'Rear
Open to qualified master's degree students. Internship experience in an agency or corporate unit with security responsibilities, under the supervision of an appropriate staff member. Students must preregister for the course. Credit for the course cannot be used toward the 36 semester hours required for the master's degree.

298 **Forensic Sciences Practicum (1)** O'Rear
Open to qualified master's degree students. Internship experience in a forensic science laboratory or criminal justice agency, under the supervision of an appropriate staff member. Students must preregister for this course. Credit for the course cannot be used toward the 36 semester hours required for the master's degree.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

## FRENCH

See **Romance Languages and Literatures.**

## GENERAL CURRICULUM IN THE LIBERAL ARTS

*Bachelor of Arts: General Curriculum in the Liberal Arts (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Humanities—39–45 semester hours:

(a) 6 semester hours selected from Engl 9 or 10, 11 or 12, and 101. If Engl 11 or 12 is waived by departmental examination, Engl 111 or a creative writing course may be selected along with Engl 101 in satisfaction of this requirement.

(b) 6 semester hours selected from courses in a foreign language beyond the second-year sequence. This requirement may be waived if advanced literature courses (such as Fren 51–52), in which all the reading is done in the foreign language, are taken to satisfy 2(c).

(c) 18 semester hours selected from the following: AmCv 71–72, 171–72, 771, and 772; any course in English translation offered by the Classics Department (excluding Clas 63 and 64); Chin 163–64, 181–82, Japn 111–12, any literature course offered by the English Department, any course in English translation offered by the Germanic Languages and Literatures Department, any Humanities course, Fren 51–52 or 91–92; Ital 51–52;

Span 51–52 or 91–92; Slav 91–92. In most cases, the third year of foreign language study (such as Fren 9–10) cannot be applied toward this requirement.

(d) 6 semester hours selected from Phil 50, 71, 111, 112, 113, 162, 172

(e) 3 semester hours selected from Rel 1, 2, 9, 10, 103, 105, 111, 113, 114, 115, 116, 121, 157, 158, 159, 160, 161, 163, 164, 165

(f) 6 semester hours selected from any combination of the following: any art history course (except Art 119, 162, and 173 through 198); Comm 49, 126, 143, and 144; Mus 3, 4, 7, 8, 101–2, 103–4, 109, 110, 121; TrDa 45, 46, 145–46, 151, 152, 153, 190, 191

3. *Social Sciences*—18 semester hours:

(a) 6 semester hours of second-group history courses (excluding Hist 191–92 and 197)

(b) 6 semester hours selected from Econ 1–2 or PSc 1, 2, 3–4, and all political science courses numbered 105 through 186 and 190

(c) 6 semester hours selected from one of the following groups: Anth 2, 3, 150, 151, 152, 158, 161, 162, 173, 175, 177; Geog 1, 2, and all second-group courses except Geog 104 through 107, 120, 121, 151 through 161; Psyc 1 combined with Psyc 8, 111, 129, 144 or 151; any approved combination of courses offered by the Sociology Department

4. *Natural and Mathematical Sciences*—18–22 semester hours:

(a) 6–8 semester hours in each of two laboratory sciences, one sequence selected from BiSc 3–4 or 11–12; and Geol 1–2, 5, or 105 and one sequence selected from Chem 3–4 or 11–12; and Phys 1 or 21 with 5, and 2 or 22 with 6, or 9–10

(b) 6 semester hours selected from Math 9–10, 12–13, 30 through 33, 51–52, or another approved combination of courses that includes at least one second-group course

5. Electives—35–45 semester hours of courses selected in consultation with the advisor

A student must earn a grade of C– or better in all second-group courses offered in fulfillment of the requirements of this program. If a student chooses a major, elective courses may be used to fulfill its requirements. A minimum of 36 semester hours must be taken in second-group courses. See Interdisciplinary Programs under Columbian College of Arts and Sciences for a general description of this program.

## GENETICS—GRADUATE PROGRAMS

**Committee on Genetics**

S.O. Schiff (*Director*), W.F. Anderson, A.M. Attalah, K.M. Brown, D.J. Brusick, R.C. Crystal, P. Czerski, R.F. De Giovanni-Donnelly, W. Drohan, R.C. Gallo, C.T. Garrett, I. Goldman, G. Hager, B.H. Howard, D.E. Johnson, K.A. Kennedy, P.D. Kind, A. Kumar, J.W. Larsen, W.M. Leach, R. Mage, C.R. Merril, T.W. Moody, D. Morris, P. Noguchi, S. O'Brien, U.R. Rapp, K.N. Rosenbaum, B. Safer, J. Schlom

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of genetics. This program is directed by a committee whose members are drawn from the Departments of Biochemistry, Biological Sciences, Microbiology, Obstetrics and Gynecology, Pathology and Pharmacology and from government agencies and private industry.

A bachelor's degree and acceptable Graduate Record Examination scores are required for admission to the degree program. The undergraduate program must have included the following: 8 semester hours each in biology, inorganic chemistry, and organic chemistry; 6 semester hours in physics; 6 semester hours in English composition and literature; one course in at least two of the following areas: genetics, cell biochemistry, cell or molecular biology.

*Master of Science in the field of genetics*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The 30 semester hours required in this program must include Gnet 201 and Gnet 299–300. The remaining 22 semester hours of course work are to be selected, with the approval of the Committee on Genetics, from the departmental courses listed below.

*Doctor of Philosophy in the field of genetics*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study must

include Gnet 301, 8–10 semester hours of biochemistry, 6–8 semester hours of cell biology, 10–12 semester hours of genetics, and 3 semester hours of statistics. These courses may be selected from the departmental listings below. (Course descriptions are listed under the department concerned.)

201 **Advanced Problems in Genetics** (2) Staff
Lectures on selected topics by members of the Committee on Genetics. Required of all master's degree candidates in the Genetics Program. Limited to students enrolled in the Genetics Program unless special permission is obtained from the director. (Fall)

295 **Research** (arr.) Staff
Open to qualified master's degree students. Research on problems approved by the Committee on Genetics. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Academic year)

301 **Advanced Problems in Genetics** (2) Staff
Lectures on selected topics by members of the Committee on Genetics. Required of all Ph.D. candidates in the Genetics Program. Limited to students enrolled in the Genetics Program unless special permission is obtained from the director. (Fall)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

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Anat 203 *Human Developmental Anatomy*
Bioc 221–22 *General Biochemistry*
Bioc 223 *Physical Biochemistry*
Bioc 229 *Biochemistry of Enzymes*
Bioc 231 *Bioenergetics*
Bioc 250 *Cell and Molecular Biology*
Bioc 251 *Advanced Topics in Molecular Biology*
Bioc 252 *Biochemical and Molecular Aspects of Selected Diseases*
Bioc 256 *Biochemical Genetics and Inherited Metabolic Diseases*
Bioc 270 *Biochemistry and Cell Biology of the Immune Response*
BiSc 111 *Introductory Microbiology*
BiSc 122 *Cell Biology*
BiSc 123 *Cell Biochemistry*
BiSc 124 *Cell Biochemistry Laboratory*
BiSc 127 *Genetics*
BiSc 128 *Genetics Laboratory*
BiSc 138 *Advanced Genetics*
BiSc 145 *Introduction to Vertebrate Embryology*
BiSc 146 *Experimental Developmental Biology*
BiSc 167 *Radiation Biology*
BiSc 212 *Seminar in Comparative Reproductive Biology*
BiSc 220 *Seminar: Cell or Plant Biochemistry*
BiSc 227 *Seminar: Genetics*
BiSc 228 *Population Genetics*
BiSc 229 *Cytogenetics*
BiSc 230 *Human Genetics*
BiSc 248 *Analysis of Development*
BiSc 249 *Seminar: Developmental Biology*
BiSc 272 *Electron Microscopy*
BiSc 273 *DNA Replication*

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| BiSc 274 | Gene Regulation and Genetic Engineering |
| BiSc 275 | Introduction to Recombinant DNA Techniques |
| Micr 211 | Microbiology |
| Micr 214 | Tissue Cell Culture |
| Micr 219 | Scientific Writing |
| Micr 229 | Immunology |
| Micr 230 | Immunology Laboratory |
| Micr 233 | Virology |
| Micr 234 | Virology Laboratory |
| Micr 260 | Cellular Immunology |
| Phar 203 | Fundamental Principles of Pharmacology |
| Phar 222 | Genetic Toxicology |
| Phar 258 | Cancer Chemotherapy |
| Stat 127 | Statistics for the Biological Sciences |
| Stat 129 | Introduction to Computing |

## GEOBIOLOGY—GRADUATE PROGRAMS

**Committee on Geobiology**
A.G. Coates (*Chair*), A. Brooks, M.A. Buzas, R.E. Knowlton, D.L. Lipscomb, H. Merchant, A. Viterito

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of geobiology. The program is directed by a committee whose members are drawn from the Departments of Anthropology, Biological Sciences, Geography and Regional Science, and Geology. It is enhanced by cooperative relationships with the Smithsonian Institution and the U.S. Geological Survey.

A bachelor's degree in anthropology, biology, botany, geography, geology, or zoology from this University, or an equivalent degree from another accredited institution of higher learning, is required for admission to the program. Prerequisite University courses (or equivalent courses elsewhere) include the following: BiSc 101 or 104 or Anth 187, BiSc 108 or Anth 187, BiSc 140; Geol 2, 151 or 154 or Anth 188; Stat 91.

*Master of Science in the field of geobiology*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program includes 30 semester hours of course work, plus a thesis (equivalent to 6 semester hours). Required courses include BiSc. 107 or 168 or 169, 208, 209, Geol 195, 254, and 255. Electives are selected from the following (to total, with the required courses, at least 30 semester hours): Anth 152, 1[illegible] 84, 186, 187, 188, 201, 204, 283, 294; BiSc 102, 103, 104, 105, 106, 110, 138, 141, [illegible] 144, 162, 168, 169, 204, 207, 210, 211, 221, 227, 228, 229, 242, 243; Geog 104, 106, [illegible] 219, 220; Geol 105, 125, 128, 152, 154, 158, 163, 175, 181, 241, 253, 258, 263, 266, [illegible]

*Doctor of Philosophy in the field of geobiology*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program includes [illegible] semester hours of course work, plus a dissertation (equivalent to 24 semester hours). Required courses include: BiSc 107, 208, 209, 211, 228; Geol 125, 195, 254, 255, [illegible] Electives are to be selected from remaining elective courses listed for the master's degree (to total, with the required courses, at least 48 semester hours).

*Research fields*: Any subdiscipline of anthropology, biology, geography and/or geology that pertains to research in ecology and evolution.

## GEOGRAPHY AND REGIONAL SCIENCE

*Professors* M. Gordon, J.C. Lowe (*Chair*)
*Professorial Lecturers* E. Marasciulo, G.J. Demko, B. Thomas
*Associate Professorial Lecturers* J.A. Zinn, J. Banister, S.E.S. Mastran
*Assistant Professor* A. Viterito
*Assistant Professorial Lecturers* S. Wright, W.B. Wood

*Bachelor of Arts with a major in geography (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required courses in the major—Geog 1, 2; 30 semester hours of second-group geography and regional science courses to be chosen in consultation and with the approval of the undergraduate advisor. One course must be chosen from each of the following: Group A—Geog 108, 110, 132, 136; Group B—Geog 125, 126, 140, 141; Group C—Geog 127, 133, 145, 146; Group D—Geog 104, 105, 106, 107.

*Minor in geography*—Required: 21 credit hours, including Geog 1, 2, and one course from each of the following groups: Group A—Geog 127, 145, 146; Group B—Geog 125, 126, 141; Group C—Geog 108, 110, 137; Group D—Geog 132, 134, 135, 136; Group E—Geog 124, 140, 143.

*Bachelor of Science with a major in cartography (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required courses in the major: Geog 1, 2, 104, 106, 121; Cart 128; two courses to be chosen from each of the following groups—(Group A) Geog 107, 120; Cart 17, 131; (Group B) Cart 110, 112, 113, 126.
3. Required courses in related areas: Math 31, 32; Stat 129, 130.
4. The department strongly recommends that elective course work in geography, geology, and statistics/computer and information systems be selected in consultation with the advisor.

*Master of Science and Doctor of Philosophy in the field of geobiology*, see Geobiology.

## GEOGRAPHY AND REGIONAL SCIENCE

### First Group

1 **Introduction to Geography I** (3) Lowe, Gordon
A systematic survey of human geography: cultural perspectives on the use of space, including urbanization, geopolitics, and land use. (Fall and spring)

2 **Introduction to Geography II** (3) Viterito
A systematic survey of environmental geography: perspectives on environments and human ecology, including ecosystems and their use, human population dynamics, and resource geography. (Fall and spring)

3 **The Physical Environment** (3) Viterito
A study of the earth's physical environment, its systems, subsystems, and physical processes. Laboratory fee, $25.

91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
Same as IAff 91.

### Second Group

104 **Maps and Mapmaking** (3) Wright
Descriptive and statistical techniques for thematic mapping; computer cartography. Laboratory fee, $25.

105 **Techniques of Spatial Analysis** (3) Viterito
Nature of geographical inquiry, approaches to the study of geography, empirical research methods.

106 **Remote Sensing of the Environment** (3) Viterito
Examination of the principles and applications of remote sensing techniques using color infrared, microwave, and satellite imagery. Laboratory fee, $25.

107 **Air Photo Interpretation** (3) Staff
Use of aerial photography for problems in land use, urban analysis, archaeology, and environmental monitoring. Laboratory fee, $25.

108 **Weather and Climate** (3) Viterito
An examination of atmospheric processes and climatic regions. Laboratory fee, $25. Prerequisite: Geog 2.

110 **Climate and Human Ecology** (3) Viterito
Effects of climate on human activities. Examination of human-induced climate change. Prerequisite: Geog 2.

120 **Geographic Information Systems** (3) Staff
Analysis of cartographic data structures and automated mapping data bases. Examination of digitizing and plotting techniques. Laboratory fee, $25.

121 **Computer Mapping** (3) Staff
Analysis and application of computer mapping methods. Examination of FORTRAN and BASIC programming methods as they apply to cartography. Laboratory fee, $25.

124 **Urban Transportation** (3) Lowe
The relationship between freight and passenger transportation systems and urban land use patterns and structure. Prerequisite: Geog 1.

125 **Transportation and Communication** (3) Lowe
The structure and evolution of transportation and communication networks and their impact on regional development. Prerequisite: Geog 1.

126 **Location in Manufacturing and Agriculture** (3) Staff
Theories dealing with the location and dynamics of economic activities. Prerequisite: Geog 1.

127 **Population and Settlement** (3) Gordon
Patterns of world population: factors contributing to population pressures, growth, and migrations. Prerequisite: Geog 1.

132 **Resource Management and Conservation** (3) Staff
Principles and practices in effective utilization of resources of national, regional, and local resources, including resource policy, environmental systems, perception, and impact studies. Prerequisite: Geog 2.

133 **People, Land, and Food** (3) Gordon
Spatial disparities in world food production, demand, and distribution; regional food–population balances; food supply problems and prospects. Prerequisite: Geog 1 or 2.

134 **Energy Resources** (3) Staff
Analysis of regional patterns and trends in consumption and production of energy resources. Examination of international energy linkages and energy policies of selected nations. Prerequisite: Geog 2.

135 **Resources and Environmental Quality** (3) Staff
Investigations into questions of resource use and environmental quality. Emphasis on public policy and societal attitudes as they influence resource use. Prerequisite: Geog 2.

136 **Water Resources** (3) Viterito
Analysis of the spatial patterns, development, and use of water resources. Prerequisite: Geog 2.

137 **Environmental Hazards** (3) Viterito
Examination of natural hazards in terms of their types, distributions, and impacts on human activities. Prerequisite: Geog 2.

140 **Urban Form and Dynamics** (3) Staff
Analysis of the internal spatial structure of cities; emphasis on explaining patterns and dynamics of location within the city. Prerequisite: Geog 1.

141 **Urban Settlement** (3) Staff
The location of cities, urbanization processes, theories and models of urban location and development. Prerequisite: Geog 1.

143 **Socio-Spatial Behavior** (3) Lowe
Behavioral perspectives on human spatial activities in cities. Prerequisite: Geog 1.

145 **The Cultural Landscape** (3) Staff
Analysis of the relationships between culture and environment; emphasis on spatial and ecological considerations. Prerequisite: Geog 1.

146 **Politics in Place and Space** (3) Staff
Interrelationships among the human and physical environment and political systems, the organization of political territories. Prerequisite: Geog 1.

147 **Military Geography** (3) Gordon
An examination of environmental and locational factors and their impact on military planning and operations. Prerequisite: Geog 1 or 2.

151 **Man and Land in North America** (3) Staff
An examination of the social, environmental, and economic factors that have led to development of the several regions of the U.S. and Canada. Prerequisite: Geog 1 or 2.

154 **Man and Land in the Middle East and North Africa** (3) Gordon
Cultural and physical regional patterns of the Middle East and North Africa. Prerequisite: Geog 1 or 2.

161 **Man and Land in Latin America** (3) Gordon
Examination of spatial characteristics of physical and cultural phenomena in Middle and South America. Prerequisite: Geog 1 or 2.

189–90 **Readings in Geography** (arr.) Staff
Prerequisite: 12 credit hours of geography and permission of instructor.

198 **Special Topics** (3) Staff
Consideration of geographic aspects of topical and future problems of society. May be repeated for credit provided that the topic differs. Prerequisite: Geog 1 or 2.

199 **Internship** (3) Staff
Field work, internship or other controlled assignment with an agency or organization engaged in work in applied geography. Prerequisite: 12 credit hours of geography courses and permission of instructor.

**Third Group**

219 **Seminar: Climatology** (3) Viterito
Atmospheric circulation systems, controls, and distribution. Elements of synoptic climatology, including climate modeling.

220 **Seminar: Climatic Change** (3) Viterito
Climatic history; examination of natural and induced climatic change.

222 **Seminar: Resources and the Environment** (3) Staff
Analysis of the spatial variations and interrelationships of resources and the environment.

223 **Seminar: The Population–Food Balance** (3) Gordon
Spatial problems associated with the dynamics and interaction of population growth and agricultural output.

224 **Seminar: Political Geography** (3) Staff
Examination of the political factor in location theory and analysis of the nature of political territories.

225 **Seminar: Transportation Geography** (3) Lowe
Transportation and communication in the organization of space.

230 **Seminar: Spatial Implications of Resource and Environmental Policy** (3) Staff
A consideration of the differential regional implications of and responses to resource and environmental policy decisions due to regional differences in societal and physical parameters.

243 **Seminar: Urban Geography** (3) Lowe
Evolving morphology and internal spatial patterns of cities.

244 **Seminar: Urban Systems** (3) Staff
Central place theory and other theories of urban location and the organization of systems of cities.

250 **Regional Development** (3) Gordon
Geographic perspectives on the policy, planning, and programmatic aspects of regional development.

261 **Latin American Geopolitical Trends** (3) Marasciulo
Political and economic factors in a development context; emphasis on natural and human resources and environmental and land use issues.

265 **Seminar: Geography of the Soviet Union** (3) Staff
Survey of U.S.S.R. regions and major topical themes of Soviet geogra-

phy, including population, energy, agriculture, transportation, and regional development.

266 **Seminar: Geographic Perspectives on Contemporary China** (3) Banister
China's development prospects: environmental constraints, population growth, and regional differences in context of Chinese cultural patterns and political organization.

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Same as IAff 287.

290 **Principles of Demography** (3) Boulier
Same as Econ/Soc/Stat 290.

291 **Methods of Demographic Analysis** (3) Boulier
Same as Econ/Soc/Stat 291.

295 **Research** (arr.) Staff
May be repeated for credit.

299–300 **Thesis Research** (3–3) Staff

## CARTOGRAPHY

17 **Elementary Photogrammetry** (3) Staff
Fundamentals of aerial photography, photogrammetric optics, and photographic processes; mathematics of vertical and tilted photographs; stereoscopy and parallax; planning and executing the photogrammetric project radial triangulation methods; photomaps; oblique and terrestial photography Prerequisite: Math 31. Laboratory fee, $25.

110 **Map Projections** (3) Staff
Elementary theory of projections in cartography. Projections of the sphere and ellipsoid on plane, conical, and cylindrical surfaces. Prerequisite: Geog 104, Math 32. Laboratory fee, $25.

112 **Introduction to Cartographic Management** (3) Staff
An examination of the managerial aspects of the cartographic production cycle. Analysis to include data collections, processing, editing, and project scheduling. Prerequisite: Geog 104.

113 **Map Design** (3) Staff
Principles of human perception and visual communication as applied to map layout and symbolization. Prerequisite: Geog 104. Laboratory fee, $25.

124 **Special Topics in Cartography** (3) Staff
Problem areas of current interest in the cartographic sciences. May be repeated for credit provided the topic differs. Prerequisite: Geog 104.

126 **Topographic Mapping** (3) Staff
Application of control surveys and photogrammetry to topographic mapping Prerequisite: Geog 104. Laboratory fee, $25.

128 **Thematic Mapping** (3) Staff
Examination of various techniques used in presentations of qualitative and quantitative data. Prerequisite: Geog 104. Laboratory fee, $25.

131 **Advanced Remote Sensing** (3) Staff
The application of remote sensing to earth resource studies with emphasis on the physical characteristics of electromagnetic radiation, multispectral sensing, and photographic and digital image analysis. Prerequisite: Geog 104, Math 31. Laboratory fee, $25.

## GEOLOGY

*Professors* F.R. Siegel, A.G. Coates, R.C. Lindholm (Chair), J.F. Lewis, D.J. Stanley (Research)
*Adjunct Professors* J.W. Pierce, M.A. Buzas, W. Back
*Professorial Lecturers* D. Appleman, C.B. Cecil
*Associate Professor* G.C. Stephens
*Associate Professorial Lecturers* J.F. Sutter, J.H. Kravitz
*Assistant Professors* R.P. Tollo, L.E. Osterman

*Assistant Professorial Lecturers* F.J. Collier, R.W. Stanton, L.E. Edwards, R.C. Haney, M.J. Baedecker, G.B. Rabchevsky
*Lecturers* R.T. Rye, M.K. Brett-Surman

*Bachelor of Arts or Bachelor of Science with a major in geology (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required introductory course—Geol 1–2.
3. Required courses in related areas—(a) Chem 11–12; (b) Math 30 (for the degree of Bachelor of Arts) or Math 30 and 31 (for the degree of Bachelor of Science); (c) Stat 91; and (d) BiSc 11 or 12 or Phys 1 (for the Bachelor of Arts) or BiSc 11 or 12 *and* Phys 1 (for the Bachelor of Science).
4. Required courses in the major—Geol 111, 112, 117, 118, 122, 151–52 for both the degrees of Bachelor of Arts and Bachelor of Science; Geol 166, 189, 195 for the Bachelor of Science degree only.

*Bachelor of Science with a major in geology—engineering option (engineering geology) (departmental)*—An interdisciplinary curriculum offered by the Geology Department and the Civil, Mechanical, and Environmental Engineering Department in the School of Engineering and Applied Science. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required introductory courses—ApSc 57, 58; Chem 13; CSci 51; Geol 1–2; Math 31, 32, 33; Phys 14, 15, 16; or equivalents.
3. Required courses in the major—CE 120, 140, 166, 167, 168, 182, 185; Geol 111–12, 117, 118, 122, 175, 189, 195, and one course chosen from Geol 128, 141, or 163 and Math 111, 112; ME 126, 131; Stat 91 or 102 or ApSc 115.

*Minor in geology*—18 semester hours selected with approval of the departmental advisor to undergraduates, including 6 hours of introductory geology (Geol 1–2; 5 and 105); two courses selected from Geol 111, 122, 151, and two from Geol 124, 125, 128, 150, 163, or from requirements of the B.A. and B.S. (For students with special interdisciplinary interests, substitutions can be arranged.)

*Master of Science in the field of geology*—Prerequisite: the degree of Bachelor of Arts or Bachelor of Science with a major in geology and scores on the Graduate Record Examination.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Course work must include Geol 141, 163, 205, and 272. Candidates are required to pass a Master's Comprehensive Examination.

Both a thesis and nonthesis option are available. Under the thesis option, a minimum of 30 semester hours of course work is required, including Thesis Research; candidates must pass the Master's Comprehensive Examination before submitting their thesis work. Under the nonthesis option, a minimum of 36 semester hours of course work is required; course work must include Geol 128, 175, 189, 219, and 295. Two electives must be chosen from Geol 216 or 263, 211 or 224, 241 or 243, and 158 or 254 or 266.

A concentration in hydrogeology is available as a nonthesis program. A minimum of 36 semester hours is required, including Geol 128, 175, 189, 275, 276, and 249, plus Stat 129. (Geol 205 and 272 are not required for this concentration.) The Department recommends that the program include field hydrogeology, which is not available at the University and should be taken elsewhere.

*Master of Science in the field of geochemistry (an interdepartmental degree offered by the Departments of Geology and Chemistry)*—Prerequisite: a bachelor's degree with a major in geology or in chemistry and, at a minimum, introductory courses in the other field.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Chem 111–12, Geol 141, 241 or 243, 249, Chem 213 or other upper-level chemistry course approved by the advisor; and Geol 299–300. Geol 105, 111, 122, 124, 132, 136, 151, and 152 may not be taken for graduate credit. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. Stat 129 or another course approved by the advisor must be passed.

*Master of Science and Doctor of Philosophy in the field of geobiology*—see Geobiology.

*Doctor of Philosophy in the field of geology*—Required: the general requirements stated under the Graduate School of Arts and Sciences and the satisfactory completion of the General Examination in three fields, one of which must be in petrology, stratigraphy, or structural geology.

*Research fields:* geochemistry, hydrogeology, marine geology, mineralogy, paleontology, petrology, sedimentology, stratigraphy, and structural geology.

*Doctor of Philosophy in the field of geochemistry (an interdepartmental degree offered by the Geology and Chemistry Departments)*—Required: the general requirements stated under the Graduate School of Arts and Sciences, including the satisfactory completion of Stat 129 and either Stat 117 and 118 or Stat 91, and the satisfactory completion of the General Examination in four fields, including geochemistry and chemistry.

**First Group**

1–2 **Introductory Physical and Historical Geology** (3–3) Stephens, Tollo, Lindholm, Osterman
Lecture (3 hours), laboratory (2 hours). An introduction to the principle features of the composition, structure, and history of the earth. Topics include nature of minerals and rocks, physical processes, energy resources, plate tectonics, origin of life, and evolution. Prerequisite to Geol 2: Geol 1 or 5. Laboratory fee, $25 per semester. Credit will not be given for both Geol 1 and 5. (Academic year)

5 **Environmental Geology** (3) Siegel, Lewis, Lindholm
Lecture (2 hours), laboratory (2 hours). An introduction to the principa features of physical geology, with emphasis on the relation of people and society to natural environments; population evolution, natural hazards, and mineral resources; economic, legal, and political aspects. Laboratory fee, $2 Credit will not be given for both Geol 1 and 5. (Fall and spring)

**Second Group**

105 **Geological Hazards in Land-Use Planning** (3) Sieg
Lecture and laboratory. An analysis of geological hazards and related factor that affect land-use planning. Field trip. Prerequisite: Geol 1 or 5, permission of instructor. Laboratory fee, $15. (Spring)

111 **Mineralogy** (4) Tol
Lecture and laboratory. Morphological crystallography and systematic mineralogy. Prerequisite: Geol 1; Chem 11 (may be taken concurrently); or permission of instructor. Laboratory fee, $22. (Fall)

112 **Optical Mineralogy** (4) Tollo
Basic light theory, optical characterization of minerals, thin section analysis Prerequisite: Geol 111. Laboratory fee, $26. (Spring)

113 **Crystallography** (3) Applem
Point-group and space-group theory, fundamentals of crystal structure, x-r diffraction theory and application. Prerequisite: Math 31. Laboratory fe $15. (Alternate academic years)

117 **Petrology** (2) Lew
Introduction to silicate phase systems; physics and chemistry of crustal an magmatic processes; volcanic processes and products. Prerequisite: Geol 1 111, 112; Phys 1 or equivalent; or permission of instructor. (Fall)

118 **Petrology Laboratory** (2) Lew
Concurrent registration in Geol 117 required for geology majors. Prerequisite Geol 111 and 112. Laboratory fee, $26. (Fall)

122 **Structural Geology** (4) Steph
Study of natural and experimental rock deformation and the relations between stress and strain as recorded by geologic structures. Prerequisite Geol 1–2. Laboratory fee, $10. (Fall)

124 **Geologic Map Interpretation** (2) Stephens
Interpretation and analysis of geologic maps and cross sections. Prerequisite: Geol 122. Laboratory fee, $5. (Spring)

125 **Marine Geology** (3) Kravitz
Lecture and map work. Principles of oceanography and submarine geology: topography, crustal structure, sedimentary processes, and marine environment. Prerequisite: Geol 1 or permission of instructor. (Fall)

128 **Geomorphology** (3) Rabchevsky
Lecture (2 hours), laboratory as arranged. Nature and evolution of earth forms; principles of photointerpretation. Prerequisite: Geol 1. Laboratory fee, $10. (Spring)

136 **Introduction to Engineering Geology** (3) Lewis
For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Phys 2 or equivalent, or permission of instructor. Laboratory fee, $20. (Fall and spring)

141 **Introductory Geochemistry** (3) Siegel
Principles and theories on the abundance, relationships, and distribution of the elements in various rock and mineral species. Prerequisite or concurrent registration: Geol 117 or equivalent: Chem 11–12; Math 31; Phys 1 or 3; or permission of instructor. Laboratory fee, $15. (Fall)

150 **Dinosaurs: Evolution and Natural History** (3) Brett-Surman
An introductory course on the natural history of dinosaurs—their evolution, biology, and ecology, their false portrayal in the press, and how scientists study them. (Spring and summer)

151–52 **Invertebrate Paleontology** (3–3) Osterman, Collier
Biology, taxonomy, functional morphology, and evolutionary patterns of the invertebrate fossil groups, with emphasis on the macroinvertebrates. Prerequisite: Geol 1–2 or permission of instructor. Laboratory fee, $20 per semester. (Academic year)

154 **Vertebrate Paleontology** (3) Brett-Surman
Lecture (2 hours), laboratory or field work as arranged. General features of vertebrate morphology and evolution; problems of paleoecology and adaptation. (Fall, odd years)

158 **Micropaleontology** (3) Osterman
Biology, morphology, paleoecology, biogeography, and biostratigraphy of marine and non-marine phosphatic, organic, siliceous, and calcareous microfossils. Prerequisite: Geol 1–2 or permission of instructor. (Fall, even years)

163 **Sedimentology** (3) Lindholm
*(Formerly 4 credits).*
Lecture and laboratory, field trips as arranged. Principles of sedimentology, analysis and interpretation of sedimentary processes and environments. Prerequisite: Geol 1; Stat 91; or permission of instructor. Laboratory fee, $22. (Spring)

166 **Principles of Stratigraphy** (3) Osterman
Fundamentals of stratigraphic principles and practice. Review of historical concepts, section measuring, vertical and lateral lithostratigraphic relationships, magnetic and climatic stratigraphy, biostratigraphic classification, zonation, correlation, geochronology, facies, and stratigraphic maps. Prerequisite: Geol 151–52 or permission of instructor. (Fall)

168 **Geology of Coal** (3) Stanton, Cecil
Geologic setting, petrography, and physical/chemical characteristics of coal. Prerequisite: Geol 117, 118, and 163. Laboratory fee, $20. (Spring, even years)

175 **Hydrogeology** (3) Back
The occurrence, storage, movement, quality, and problems of pollution of subsurface water and the hydrologic properties of water-bearing materials.

Prerequisite: Geol 111, 122; Math 31; Chem 11–12; or permission of instructor. Laboratory fee (field trips), $8. (Spring) Stephens

189 **Geophysics for Geologists** (3)
Basic geophysics to assist the geologist mapping and solving geologic problems. Prerequisite: Geol 1–2; Math 31; Phys 1; or permission of instructor. (Spring) Tollo, Stephens

195 **Field Methods** (3)
Weekend field trips. Surveying, geological mapping, and specific field work methods. Students will be responsible for room and board expenses while at field camp (one week). Prerequisite: Geol 122. Laboratory fee (field trip fee), $20. (Spring) Staff

199 **Undergraduate Research or Reading** (arr.)
Problems approved by the staff. May be repeated once for credit. (Fall and spring)

**Third Group** Haney

205 **Seminar in Geology** (1)
Special topics each semester. May be repeated for credit. Tollo

211 **Advanced Mineralogy** (3)
Crystal chemistry, phase relations, and paragenesis of major rock-forming minerals. Prerequisite: Geol 111 or permission of the instructor. (Spring, odd years)

216 **Sedimentary Petrography** (3) Lindholm
Identification, classification, and interpretation of common sedimentary rocks by means of the petrographic microscope. Prerequisite: Geol 112, 163 or permission of instructor. Laboratory fee, $25. (Fall, odd years)

219 **Petrogenesis I** (3) Lewis
The origin of selected igneous and metamorphic rock types. Prerequisite: Geol 117, 118, or permission of instructor. Laboratory fee, $22. (Fall)

220 **Petrogenesis II** (3) Lewis
Laboratory fee, $22. (Spring) Stephens

224 **Advanced Structural Geology** (3)
Study of problems in structural analysis and tectonics. Prerequisite: Geol 122. (Spring, odd years) Siegel

241 **Marine Geochemistry** (3)
Chemical composition and physical properties of sea water, chemical composition and alterations of marine sediments, thermodynamics and biochemical activity in oceans. Methods of analysis and problems of measuring. Prerequisite: Geol 141, Math 31, or permission of instructor. Recommended: Chem 2. Laboratory fee, $20. (Spring, even years) Steed

243 **Geochemical Prospecting** (3)
Application of geochemical principles and analyses to the detection of hidden ore deposits. Field trips as arranged. Prerequisite: Geol 141. Laboratory fee, $20. (Spring, odd years) Staff

249 **Seminar: Geochemistry** (2)
Independent topics each semester; may be repeated for credit. Coats

254 **Evolutionary Paleobiology** (3)
Consideration of modern evolutionary theory with emphasis on the fossil record. (Fall, even years) Buzas

255 **Quantitative Paleoecology** (3)
Characteristics of populations applicable to the fossil record. Subject matter includes ecosystem concept, habitat, Hutchinsonian niche, life-death, frequency distributions, competitive exclusion principle, spatial distributions, relative abundance and diversity, quantification of communities and species. Prerequisite: Geol 151–52, Stat 91; or permission of instructor (Fall, odd years) Osterman

258 **Seminar: Micropaleontology** (3)
Prerequisite: Geol 158 or permission of instructor. May be repeated for credit. (Fall, odd years)

263 **Sedimentary Environments** (3) Lindholm
Study of selected depositional environments. Field trips as arranged. Prerequisite: Geol 163; Stat 91. Laboratory fee (field trips), $20. (Fall, even years)

266 **Advanced Stratigraphy** (3) Edwards
Analysis of special topics in stratigraphy. Historical background, concept of facies, cycles of sedimentation, clastic and carbonate subsurface lithofacies, subsurface biostratigraphy, ecological and evolutionary attributes of stratigraphically useful organisms, quantitative methods, isochronology, geochronology, and magnetic stratigraphy. Prerequisite: Geol 166 or equivalent. (Spring, even years)

272 **Regional Geology of North America** (3) Tollo
Petrology, stratigraphy, and structure of various physiographic and tectonic provinces. (Spring, even years)

275 **Geochemistry of Groundwater** (3) Back
Application of geochemical principles to the interpretation and prediction of groundwater activity in regional systems; carbonate and silicate equilibrium; weathering and redox reactions, isotopes; and contaminated aquifers. Prerequisite: Geol 175, 141 (may be taken concurrently), or permission of instructor. (Fall, even years)

276 **Advanced Groundwater: Modeling** (3) Staff
Review of basic theory of aquifer systems, analysis of aquifer testing, and numerical methods applied to groundwater problems. Prerequisite: Geol 175 or permission of instructor. A knowledge of FORTRAN is desirable. (Spring, odd years)

295 **Research** (arr.) Staff
Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

**Fourth Group**

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## GERMANIC LANGUAGES AND LITERATURES

*Professors* J.C. King *(Chair)*, K. Thoenelt, C. Steiner
*Associate Professorial Lecturer* P. Werres
*Assistant Professorial Lecturer* G.A. Koskella

*Bachelor of Arts with a major in Germanic languages and literatures (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Ger 1–2, 3–4 (Ger 5–6 may be substituted), 9–10, 51–52, or equivalent.
3. Required courses in other areas—6 semester hours in one of the following subjects: art history, music history, or philosophy.
4. Requirements for the major—a minimum of 24 semester hours in German courses above the first group, including Ger 179–80, reasonable proficiency in speaking, reading, and writing German as determined by the department.

*Minor in German*—Required: Ger 9–10, 51–52, and 6 semester hours of second-group courses. Prerequisite: Ger 1–2, 3–4 (Ger 5–6 may be substituted), or equivalent.

*Special Honors*—In addition to the general requirements stated under Regulations, a candidate for special honors in German must submit an acceptable senior thesis on an assigned topic.

**Placement Examination:** A student who has not been granted advanced standing and who wishes to continue in college the language study begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

## GERMAN

### First Group

Staff

**1–2 First-Year German** (3–3)
Structure of the German language; basic vocabulary, reading, writing, and conversation; the culture of German-speaking areas. Three hours in the classroom and one in the language laboratory each week. Laboratory fee, $35 per semester. Prerequisite to Ger 2: Ger 1 or equivalent. (Fall and spring)

Staff

**3–4 Second-Year German** (3–3)
Continued consideration of the structure of the German language; further development of vocabulary, reading, writing, and conversation; culture and literature of Germany, Austria, and Switzerland. Three hours in the classroom and one in the language laboratory each week. Laboratory fee, $35 per semester. Prerequisite to Ger 3: Ger 1–2 or 5, or equivalent. Prerequisite to Ger 4: Ger 3 or equivalent. (Fall and spring)

Thoenelt and Staff

**5–6 Intensive Beginning and Intermediate German** (6–6)
Six hours in the classroom and two in the language laboratory each week. Ger 5 is equivalent to Ger 1–2; Ger 6 is equivalent to Ger 3–4. Laboratory fee $70 per semester. Prerequisite to Ger 6: Ger 1–2 or 5, or equivalent. (Academic year)

Steiner

**9–10 German Conversation and Composition** (3–3)
A third-year language course: German as a means of spoken and written communication. German cultural history from its historical roots to the present day. Prerequisite: Ger 3–4 or 6, or equivalent. With permission of instructor, Ger 9 or 10 may be taken concurrently with Ger 4. (Academic year)

Staff

**47 Beginning German for Reading Acquisition** (3)
For undergraduate and graduate students with little or no German who are interested in acquiring a reading knowledge of German. No academic credit for graduate students. (Fall)

Staff

**49 German Readings for Nonmajor Students** (3)
Primarily for graduate students preparing for reading examinations; undergraduates admitted. No academic credit for graduate students. Prerequisite: Ger 4, 6, or 47, or equivalent. (Spring)

Thoenelt

**51–52 Introduction to German Literature—in English** (3–3)
Ger 51—Origins of the German way of life: the Germanic loss of paradise (*Song of the Nibelungen*), the discovery of modern identity consciousness (*Parzival*), and passion as a value to be realized in life (*Tristan and Isolde*). Medieval love songs, the birth of modern individualism, and the eighteenth-century youth movement leading to the German idyll. Ger 52—German thought and civilization, from 1770 to the present; German education and social activity. The two faces of contemporary Germany: Goethe and German culture versus German politics; Germany during National Socialism and since World War II. (Academic year)

### Second Group

Thoenelt and Staff

**103–4 Major Themes of German Literature—in English** (3–3)
Topics for 1988–89: Ger 103. The Faust myth in Western literature. Faust's or man's, pursuit of happiness, its religious, philosophical, and aesthetic possibilities and limitations. Original sin in the Bible. Faust in classical and Germanic mythology: Faust figures in the works of Goethe, Dostoevsky, Stephen Vincent Benét, Paul Valéry, Thomas Mann, Camus, and others.

writers. Ger 104—Literature and politics in Germany: *Kultur* and politics, the two faces of Germany. A survey of these two aspects of German history and German life. Selected readings from relevant literary and political documents by Walther v. d. Vogelweide, Kant, W. v. Humboldt, Frederick II, Mme. de Staël, Goethe, Schiller, Marx, Heine, Nietzsche, Thomas Mann, Heinrich Mann, Brecht, and Böll. (Alternate academic years)

112 **Comparative Studies in Germanic Literatures—in English** (3) Thoenelt and Staff
Topic for 1988: Why literature? What is literature? Views and perspectives on the "usefulness" and "uselessness" of literature in modern Western societies. Selected works and excerpts from Plato, Aristotle, Shakespeare, Montaigne, Goethe, Schiller, Nietzsche, Thomas Mann, Camus, Boll, and others. (Spring, alternate years)

114 **Four Western Ways of Life—in English** (3) Thoenelt and Staff
The human condition and four Western ways of life: French moralism, German *Bildung*, Marxism, and existentialism. Selected readings from Montaigne, Goethe, Schiller, Thomas Mann, Marx, Brecht, Nietzsche, Martin Buber, and Camus. (Fall, alternate years)

125 **Utopias and Dystopias in German Letters and Thought—in English** (3) Steiner
The unfolding German intellectual genius, now at a moral peak, now perverted. Selected readings and excerpts from the works of Lessing, Bonaventura, Heine, Marx, Nietzsche, Hitler, Thomas Mann, and Hermann Hesse. (Summer)

126 **France and Germany—in English** (3) Thoenelt and Staff
Comparative study of two European ways of life as reflected and perpetuated by literature and philosophy. Relevant excerpts and documents from the 16th to the 20th century. (Spring, alternate years)

131–32 **18th-Century German Literature—in German** (3–3) Thoenelt
Enlightenment, Storm and Stress, Classicism. Central topic: *Geist und Tat*—the 18th-century concept of literature's formative function in society. Reading, lecture, and discussion. (Alternate academic years)

141–42 **19th-Century German Literature—in German** (3–3) Steiner
Romanticism, Biedermeier, Young Germany, Poetic Realism. Second age of chivalry and *Sehnsucht*, revolution and counterrevolution in thought and literature. Development of modern nationalism and cosmopolitanism as reflected in the literature of the period. Reading, lecture, and discussion. (Alternate academic years)

151–52 **20th-Century German Literature—in German (3–3)** Steiner
The age of Nietzsche, Naturalism, Impressionism, Expressionism; Kafka, Thomas Mann, Hermann Hesse; émigré literature, contemporary drama; authors of *Gruppe 47*. Reading, lecture, and discussion. (Alternate academic years)

161–62 **Studies in Germanic Languages and Literatures—in English (3–3)** King
Topics for 1988–89: Germanic mythology—characters, tales, and motifs. Runes as a cultic device. Introduction to the pre-Christian religion of the Germanic peoples and to an interdisciplinary study of mythology. Richard Wagner's use of Germanic lore in his opera *Siegfried*. (Academic year)

179–80 **Advanced German Conversation and Composition** (3–3) Thoenelt
A fourth-year language course designed to achieve near-native fluency in speaking and writing German. Discussions and compositions on literary and cultural topics, reading of the German weekly newspaper *Die Zeit*, interpretations of selected texts (Gottfried Benn and Thomas Mann), grammatical and stylistic studies. Prerequisite: Ger 9–10 or equivalent. (Alternate academic years)

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
Same as Engl/Fren/Hist Rel 183 and Art 187.

## SANSKRIT

King

105–6 **First-Year Sanskrit** (3–3)
A year course: credit toward a degree at this University given on completion of Ger 106. Language, literature, and culture of ancient India. Essentials of grammar; reading of classical texts. Aural and oral pratice in language laboratory. Laboratory fee, $35 per semester. (Alternate academic years) King

107–8 **Second-Year Sanskrit** (3–3)
A year course: credit toward a degree at this University given on completion of Ger 108. Language, literature, and culture of ancient India. Continuation and review of grammar; reading of more difficult classical and Vedic texts. Aural and oral practice in language laboratory. Laboratory fee, $35 per semester. Prerequisite: Ger 105–6 or equivalent. (Alternate academic years)

## GERONTOLOGY—GRADUATE PROGRAM

*Professors* R.G. Brown *(Academic Director)*, R.A. Kenney
*Professorial Lecturer* M.H. Morrison

**Academic Committee:** R.G. Brown, J.C. Heddesheimer, R.A. Kenney, S.D. Infeld

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Master of Arts in the field of public policy with a concentration in gerontology, directed by the Committee on Gerontology and drawing upon faculty from various departments within the University and resource persons in the community.

The gerontology program derives its theoretical perspectives and substantive knowledge from several disciplines to provide a balanced study of the processes of aging and the societal reactions and responses to the aged and their problems, with the objective of preparing persons for positions that involve the planning, development, and evaluation of programs serving older persons. Each student will work closely with an advisor to design a program of studies appropriate to individual interests and professional objectives. Every student will have field experience in an agency involved in the planning and evaluation of services for the elderly. Prospective candidates should consult with the director of the gerontology program.

*Master of Arts in the field of public policy with a concentration in gerontology*
Prerequisite: a bachelor's degree with a *B* average (or equivalent) from an accredited college or university. In some cases, the applicant may be requested to take the Graduate Record Examination. Previous experience in gerontology is not essential; a variety of academic and experiential backgrounds are acceptable.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 42 semester hours of course work. There is no thesis requirement. Core courses required for all students: Econ 217; PSc 203; Stat 104 or 111, and 183 (Stat 129 or Psyc 244 may be substituted for Stat 183); Gern 201, 205, 290; Soc 254 (PSc 204 may be substituted for Soc 254), 280; Educ 344; and HSA 235. The remaining three courses are electives. All students are required to pass a Master's Comprehensive Examination.

Kenney

201 **The Biology of Aging** (3)
The processes of aging in the various systems of the human body; principal illness patterns in the elderly; theories of the aging process. (Fall) Morrison

205 **Public Policy and Aging** (3)
The "political economy" of aging in our society. Political and governmental processes as they influence and are influenced by older persons; the impact of demographic trends and retirement patterns on the economic system. (Fall) Morrison

290 **Practicum in Gerontology** (3)
Field experience in an agency involved in the planning and evaluation of services for the elderly.

## GREEK

See **Classics**.

## HEALTH SERVICES ADMINISTRATION

Professors K.J. Darr, P.N. Reeves, P.S. Birnbaum, R.G. Shouldice, J. Ott, R.F. Southby (*Chair*), H.L. Hirsh (*Distinguished Visiting*), L.G. Pawlson, M.H. Firestone
*Adjunct Professor* A.S. Yerby
*Professorial Lecturer* H.R. Wertlieb
*Associate Professors* D.L. Infeld, W. Greenberg, D.L. Zalkind, G.E. Crum, S.R. Eastaugh
*Associate Professorial Lecturers* S.B. Cohen, C.P. McKelvey, D.P. Andrulis, J.C. Wilmot, W.H. McBeath, D.S. Good
*Assistant Professorial Lecturer* Z.F. Acevedo

See the School of Government and Business Administration for programs of study leading to the degrees of Master of Health Services Administration,* Specialist in Health Services Administration, and Doctor of Philosophy.

**Second Group**

142 **Financial Management in Health Care Institutions** (3) Staff
Consideration of the nature, analysis, and interpretation of accounting data. Cost accounting, budgeting, and internal control techniques; emphasis on their use in the management planning and control process. (Spring)

153 **Survey of Health Care Organization** (3) Staff
Introduction to the organization and delivery of health care services in the U.S. Emphasis on the structural features of and the resources available to the health care system. (Fall)

154 **Introduction to Hospital Management and Procedures** (3) Staff
Introduction to the structure and management of contemporary American hospitals; emphasis on the organization of hospital departments and the functions of the department manager. Prerequisite: HSA 153 or consent of instructor. (Spring)

170 **Quantitative Methods in Health Care Administration** (3) Staff
Application of quantitative methods to the health services industry. Fundamental statistical techniques enabling the student to read, comprehend, critically appraise, and intelligently utilize the growing volume of quantitative research appearing in the health services literature. Familiarization with quantitative procedures applied to analyzing management problems in the operational environment. Emphasis on establishing a fundamental understanding of statistical ideas rather than on manipulating predeveloped formulas. (Fall)

190 **Special Topics in Health Care Administration** (3) Staff
Experimental offering at the undergraduate level. (Fall and spring)

**Third Group**

202 **Introduction to Health and Medical Care** (3) Crum
Examination of concepts of health and disease from physical and philosophical perspectives. Description and analyses of various components of the health care system, including medical technology and the health professions. (Fall and spring)

203 **Organization and Management of Health Services** (3) Shouldice
Application of management theory and concepts to health services systems and institutions. Characteristics, functions, and organizational structures of delivery systems. (Fall and spring)

206 **Quantitative Methods in Health Services Operations** (3) Zalkind, Cohen
Concepts and applications of statistical methods in health services operations. Probabilistic reasoning and statistical methodology. Sampling and study design. Critiques of statistical studies and reporting. Prerequisite: Stat 51 or permission of the instructor. (Fall and spring)

* Accredited by the Accrediting Commission on Education for Health Services Administration.

207 **Health Services Information Applications** (3) Infeld, Zalkind
Introductory survey of health information systems. Decision-making needs, collection, analysis, and reporting of data. Principles of managing the acquisition and development of health services information systems. Prerequisite: HSA 206 and knowledge of spreadsheet or database software. (Fall and spring)

210 **Health Economics** (3) Greenberg
Economics of the health care sector. An economic analysis of public policy alternatives in the health industry. Roles of the physician, hospital, insurance, and other health care markets are examined. (Fall and spring)

211 **Health Finance** (3) Eastaugh
An introductory course designed to provide a balance between theoretical and practical approaches to the financial management of health care institutions, with emphasis on hospital examples. Specific attention is given to rate regulation, hospital reimbursement, hospital accounting, financial ratio analysis, financial feasibility studies, and strategic marketing. Prerequisite HSA 210. (Fall and spring)

212 **Introduction to Health Services Planning** (3) Reeves, Crum
Survey of community and institutional health systems planning and evaluation. Introduction to policy planning, strategic planning, project planning, marketing, and evaluation as they apply to health services. (Fall and spring)

215 **Health Services and the Law** (3) Firestone
The sources of law and the legal processes affecting the health services system. Elements of administrative law and agency processes. Introduction to the legal relationships (e.g., torts, contracts, and insurance) of facilities, physicians, personnel, and patients. Personnel administration, legal aspects of labor relations; trends in health services delivery law. (Fall and spring)

221 **Health Systems Strategic Planning** (3) Reeves
Application of strategic planning concepts to health services. Study of the strategic planning process as a series of interrelated analyses and decisions, including representative analytic methods used in the most critical stages. Discussion of the relationships among strategic planning, project planning, marketing, and financial planning. (Fall and spring)

223 **Policy in Strategic Health Services Planning** (3) Reeves
Effects of legal, political, social, governmental, and economic factors in strategic health planning. Emphasis on formulation, analysis, and implementation of state, local, and institutional health policies. The role of these policies as expressions of values that serve as guiding forces in the strategic planning process. (Summer)

225 **Developing National Health Services Policy** (3) Southby
Understanding and analyzing the processes by which health services policy is formulated and implemented at the federal level. Focus on Congress, the presidency, and the agencies. (Spring)

227 **Seminar: Ethics in Health Services Administration** (3) Parr
Legal, social, and policy implications of ethical issues in medical and health services delivery: administrative and institutional ethics, professional codes, decisions concerning impaired professionals, dying patients, fertility control, experimentation, and new technology, resource allocation. (Spring)

231 **Managing the Short-Term Hospital** (3) Parr
Organization and management of the acute care hospital—administration, governance, and medical staff. Relationships of hospital clinical, support, and administrative departments. Analyses of procedures and systems. Administrative ethics. Requirements of the Joint Commission on Accreditation of Hospitals. Prerequisite: HSA 203 and Mgt 210, or permission of instructor. (Fall and spring)

233 **Delivery of Mental Health Services** (3) Andrus
Study of the organizations and systems for delivery of mental health services; emphasis on managing and financing treatment and rehabilitation facilities. (Summer)

235 **Human Services Integration** (3) Reeves
Introduction to the concept of a human services system. Description and analysis of current human services programs as components of such a system and the roles of the public and private sectors in providing these services. Discussion of interorganizational theory as a basis for understanding current system configurations and for developing improved service delivery systems. (Spring)

236 **Introduction to Long-Term Care Administration** (3) Infeld
An overview of the field of long-term care and its evolution within the health care and social service systems. The "continuum" of long-term care services, both in institutions and in the community, funding sources for these services, and policy issues involved in delivery of services. Site visits to long-term care programs. (Summer)

237 **Managing the Long-Term Care Institution** (3) Infeld
Organization and management of nursing homes, personal and residential care facilities, and institutions for other populations needing long-term specialty treatment. Emphasis on personal and professional skills necessary to provide a wide range of services and quality care in these environments. (Spring)

238 **Ambulatory Health Services Management** (3) Shouldice
Introduction to the organization and management of ambulatory care. Presentation of models, financing mechanisms, institutional affiliations, estimating and planning for ambulatory care, and the use of group practice of medicine as part of a total system of services delivery. (Spring and Summer)

239 **Management of Health Maintenance Organizations** (3) Shouldice, Ott
Principles and fundamentals of prepaid group practice and health maintenance organizations and other alternative financing-delivery mechanisms. Emphasis on planning, development, and operation of HMOs and CMPs, including discussion of models, financial issues, consumers, and providers of care. (Fall and Summer)

245 **Case Studies in Health Services Administration** (3) Southby, Birnbaum, Crum
Intensive qualitative and quantitative analyses of major problem areas in health system administration and planning, using the case study method. Cases cover the broad spectrum of health policy, planning, and management of the health services system. Serves as a capstone course for health services students. (Fall and spring)

252 **Comparative Health Services Systems** (3) Southby
Evaluations of various organizational patterns, functions, and trends in international health services delivery systems. Emphasis on sources of such differences and the significance of systems to the health status of a nation. (Spring)

255 **Issues in Gerontology** (3) Infeld
Interdisciplinary seminar on the nature and problems of aging, including demographic, biological, psychological, social, economic, environmental, and political perspectives on the status and needs of the older population. Theory and research; service delivery; attitudes and behaviors based on contact with older persons. (Fall)

257 **Advanced Health Resources Management** (3) Eastaugh
Methods, techniques, and policies used in health resources management. Prospective rate regulation under DRGs, capital investment decisions, buy–lease decisions, financial feasibility studies, cost accounting, multihospital systems management, and strategic financial planning. Financial management of HMOs, teaching programs, nursing homes, hospices, and home health care programs. Prerequisite: HSA 211. (Fall and spring)

260 **Administration of Health Systems** (3)
Same as PubH 213. See the School of Medicine and Health Sciences *Bulletin*.

262 **Economics of Health Care** (3)
Same as PubH 211. See the School of Medicine and Health Sciences *Bulletin*.

264 **Health Planning and Marketing** (3)
Same as PubH 214. See the School of Medicine and Health Sciences *Bulletin*.

268 **Case Studies in Administrative Medicine** (3)
Same as PubH 296. See the School of Medicine and Health Sciences *Bulletin*.

270 **Research in Health Services Administration** (3) Southby
Field research. Primarily for advanced students; open to others with consent of instructor. May be repeated for credit. (Fall and spring)

271 **Field Problem Studies in Health Services Administration** (3) Southby
Work experience guided by a qualified preceptor on selected management and planning issues and problems occurring in health services facilities, programs, and agencies. Primarily for advanced master's and doctoral students; open to other students by arrangement. May be repeated for credit. (Fall and spring) Staff

273–74–75 **Residency I** (3–3–3)
Twelve-month residency. Work experience guided by a qualified preceptor; periodic written progress reports and a written major report or selected field projects as required. (Fall and spring) Staff

276–77–78 **Residency II** (3–3–3)
For students who take additional residency experience. (Fall or spring) Staff

285–86 **Readings in Health Services Administration** (3–3) Southby and Staff
Supervised readings in special areas of health services management and in policy and planning. Primarily for advanced students; open to others by arrangement. May be repeated for credit. (Fall and spring)

290 **Special Topics in Health Services Administration** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated for credit. (Fall or spring)

299–300 **Thesis Research** (3–3) Southby
(Fall and spring)

**Fourth Group**

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. They are open to selected master's students upon petition approved by the Associate Dean.

310 **Health Resources Allocation Policies** (3) Southby, Greenberg
Study of major contemporary issues in health policy and health economics. Development and critique of policies designed to deal with current health issues. (Spring)

311–12 **Seminar: Public–Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society. Prerequisite: doctoral degree candidate status.

330 **Health Services Delivery Policy** (3) Infeld
Study of major contemporary issues in health services delivery. Development and critique of policies designed to deal with those issues. For doctoral and Specialist students; to be taken toward the end of course work for the degree. (Fall)

398 **Advanced Reading and Research** (arr.) Staff
Limited to doctoral candidates preparing for the general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) (Fall and spring)
Limited to doctoral candidates. May be repeated for credit.

## HEBREW

See **Classics**.

## HISTORY

*University Professor* M.F. Cunliffe

*Professors* H.M. Sachar, R.W. Kenny, P.P. Hill, L.G. DePauw, R. Thornton, L.G. Schwoerer, P.F. Klarén, R.E. Kennedy, Jr., W.H. Becker *(Chair)*, C.M. Lovett, L.P. Ribuffo

*Professorial Lecturers* S. Shaloff, D.C. Allard, J. Schlight, M. Bohachevsky-Chomiak, M. Khadduri

*Associate Professors* C.J. Herber, W.R. Johnson, R.A. Hadley, A.D. Andrews, J.O. Horton, E. Berkowitz, M.A. Atkin

*Assistant Professors* D.J. Schroeter *(Visiting)*, F. Coetzee *(Visiting)*, M.S. Coetzee *(Visiting)*

*Assistant Professorial Lecturer* E. Angel

*Director and Principal Investigator of the First Federal Congress Project* C. Bickford

*Bachelor of Arts with a major in history (field-of-study or departmental)*—The following requirements must be fulfilled:

1. Majors must meet the general requirements of Columbian College, selecting specific courses in consultation with either a departmental or college advisor.
2. Majors must either take or waive the introductory courses: Hist 39–40, 71–72. Waiver may be accomplished by passing a departmental examination, which is held the day before registration. Credit as well as waiver may be obtained also by departmental examination, or by scoring above 600 on College Board Achievement Tests, or by scoring 4 or 5 on Advanced Placement Examinations. Neither waiver nor credit is awarded by CLEP examination.
3. Majors must complete either 12 semester hours of an approved foreign language or 9 semester hours of statistics/computing (Stat 53 and 105, and either 183 or 129).
4. Distributed courses within the major must include (for a total of 27 semester hours):
   (a) Hist 199 (proseminar);
   (b) two seminars, one of which must be a research seminar;
   (c) two 100-level courses in each of the following three fields:
   (1) Europe—Hist 101, 105, 106, 109, 110, 111, 112, 121, 122, 123, 124, 125, 127, 131, 132, 136, 139, 140, 141, 142, 147, 148, 149, 150, 151, 152, 153, 154, 155, 157, 158, 183; (2) United States—Hist 117, 118, 126, 128, 129, 133, 134, 137, 138, 167, 168, 169, 170, 171; 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 184, 185, 186, 197; (3) Russia, Asia, Africa, and Latin America—Hist 107, 108, 116, 119, 120, 135, 145, 146, 158, 161, 162, 163, 164, 165, 166, 187, 188, 189, 193, 194, 195, 196.

Special topics courses numbered 198 and courses in the 700 Series may also satisfy one of the three field requirements. Majors should check with the major advisor on the applicability of such courses.

For Special Honors in history, a history major must meet the general honors requirements listed under Regulations. In addition, the Department requires candidates to apply for the special honors program before the beginning of the second semester of the junior year. If accepted into the program, candidates enroll in the research seminar, Hist 191, during that semester, and complete a Senior Honors Thesis in Hist 192 the following semester. Only if the thesis merits the grade of A will Special Honors be recommended.

*Minor in history*—Undergraduate students who select a minor in history must ordinarily declare their intention to the departmental advisor no later than the beginning of their senior year. Such students may choose a nonspecialized history curriculum, or may concentrate in one area, such as ancient history, medieval history, early modern Europe, modern Europe, the Near East, Russia and East Europe, the United States, Latin America, or the Far East, or in one field, such as economic, social, intellectual, diplomatic, political, black, or women's history. In each case the program of courses will be planned in consultation with the history advisor. To meet the departmental requirements for a minor, the student must complete at least 15 semester hours in approved courses with a grade of C or above. One 3-semester-hour seminar must be included in the program.

*Master of Arts in the field of history*—Prerequisite: a bachelor's degree from an accredited college or university with a major in history, or an equivalent degree; high

scholastic standing; and approval of the department. Applicants from other institutions must present scores on the Graduate Record Examination and arrange for four persons, preferably former instructors, to send letters or reference forms to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of either a minimum of 30 semester hours of second- and third-group courses, including Hist 299–300, Thesis Research, and at least three other third-group courses, or a minimum of 36 semester hours of second- and third-group courses, including at least two research seminars (6 semester hours) and four readings/research seminars. Exceptions to the minimum for third-group courses can be granted only by the department's Graduate Programs Committee. Hist 201 is required of candidates who have not previously had a course in historiography and historical method. A maximum of 6 semester hours may be in approved courses outside the History Department. To receive graduate credit for second-group courses, master's candidates must arrange for extra work with the instructors. Each student works in two fields of history and is required to pass a Comprehensive Examination in each.

*Master of Arts in the field of history with a concentration in historic preservation*—Required: the general requirements stated under the Graduate School of Arts and Sciences. This 36-hour master's degree program combines courses in United States history and historic preservation. It includes at least 18 hours of U.S. social history, U.S. urban history, man-made America, and the seminar sequence in historic preservation. For other course distribution requirements, see the departmental graduate advisor. Candidates in this program may also be required to pass an examination in measured architectural drawing.

*Master of Arts in the field of history with a concentration in public policy*—Required: the general requirements stated under the Graduate School of Arts and Sciences. This 36-hour program emphasizes the study of history as it relates to the analysis and conduct of public policy. Hist 213–14 and internship required. Additional course work is to be chosen with advisor's approval.

*Doctor of Philosophy in the field of history*—Required: the general requirements stated under the Graduate School of Arts and Sciences, including the passing of a written examination in two appropriate foreign languages or in one foreign language and an approved subject, and the satisfactory completion of the General Examination in four fields. Normally, each doctoral candidate will work in one major (or general) field of study and three special fields. One of the special fields may be taken as a "write-off," as long as it is not in the area in which the candidate plans to write the dissertation. The major fields include the following: early modern Europe, modern Europe, United States, Latin America, modern Near East, modern East Asia, and modern Russia and the Soviet Union. Special fields may vary from the topical (e.g., U.S. social history, European intellectual history, historic preservation, etc.) to the chronologically limited fields (e.g., American colonial history, classical and medieval Europe, Tudor and Stuart England, etc.). A student may elect one special field outside the History Department if it is relevant to the program. Students having a special field in historic preservation may be required to pass an examination in measured architectural drawing. In the final 24 hours of course work for the General Examination, except in preparation for the "write-off" examination, the candidate may enroll only in third-group courses. Any exception requires the approval of the Graduate Programs Committee.

*Doctor of Philosophy in the field of American Religious History* (offered in cooperation with the Department of Religion)—Required: the general requirements stated under the Graduate School of Arts and Sciences and the specific requirements of the Doctor of Philosophy in the field of history, stated above. The General Examination must cover four fields, including two from the Department of History (generally American social history and one other) and two from the Department of Religion (history of religion in America and one other field in religious history).

**Waiver Examinations:** Waiver examinations are given three times per year, on the day preceding registration in the fall and spring semesters and the first summer session. Waiver examinations are not available to students in the last semester of their senior year.

**Course Accessibility:** All second-group courses are open to students without history course prerequisites with the exception of Hist 135, 157, and 199.

**First Group**

39–40 **European Civilization in Its World Context** (3–3) Staff
Hist 39: Introduction to the political, social, economic, religious, and cultural history of Europe from about 800 A.D. to 1715. Hist 40: From 1715 to the present. (Academic year)

50 **Washington, D.C.: History, Culture, and Politics** (3) Gillette and Interdisciplinary Team
Same as AmCv/PSc/U&RP 50.

71–72 **Introduction to American History** (3–3) Staff
Hist 71: political, social, economic, and cultural forces of the United States, in world perspective, from the earliest settlements to 1876. Hist 72: from 1876 to present. (Academic year)

91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
Same as IAff 91.

**Second Group**

101 **The European Revolutionary Tradition, 1640–1917** (3) Kennedy
A comparative study of the English, French, and Russian revolutions with focus on theories of revolution, revolutionary ideology, millenarianism, and the revolutionary legacy inherited by third-world movements. (Fall)

105–6 **History and Philosophy of Natural Science** (3–3) Schlagel
A history of the natural sciences and their implied cosmologies. Emphasis on empirical discoveries and modes of explanation, changing conceptual frameworks and methodologies, and philosophical implications. Hist 105: Early natural philosophy to the rise of modern science. Hist 106: Developments in the physical and biological sciences from the 19th century to the present.

107 **The Ancient Near East and Egypt to 322 B.C.** (3) Hadley
Survey of Egyptian, Mesopotamian, Anatolian, West Semitic, and Iranian civilizations from the Neolithic period to Alexander's conquest.

108 **Greece and the Near East, 359 B.C. to the Second Century A.D.** (3) Hadley
Survey of cultural, social, political, and economic developments in the Hellenistic world and societies of the Near East from the reign of Philip II to the height of Roman power and influence in these regions.

109 **Early Aegean and Greek Civilizations to 338 B.C.** (3) Hadley
Neolithic background; Bronze Age—Minoan, Helladic, and Mycenaean civilizations; classical Greek civilization to the Macedonian conquest. (Fall)

110 **The Roman World to 337 A.D.** (3) Hadley
Prehistoric Italy; rise and decline of the Roman Empire and Latin civilization; cultural, social, and political developments in the Greek world under Roman rule. (Spring)

111–12 **Medieval History** (3–3) Andrews
Hist 111: Failure of the old Roman Empire, formation of barbarian kingdoms in the West and their evolution to about 1000 A.D., Byzantium and Islam at their apogee. Hist 112: Medieval European daily life, institutions, and creative movements to about 1400, the Crusades and the Near East to the rise of the Ottoman Turks. Material fee, $5 per semester. (Academic year)

116 **History of Africa** (3) Shaloff
Survey of political, cultural, and economic development from ancient times to the present. (Spring)

117 **Crisis or Conspiracy? A History of the International Politics of Oil** (3) Becker
The history of the international politics of oil, with special attention to developing relationships between major oil companies and governments here and abroad. (Summer)

**118 History of North Africa** (3) Schroeter
A study of the Maghreb from the 15th to the 20th century. (Spring)

**119 China in the 20th Century: Reform and Revolution** (3) Johnson
Origins, goals, substance, and significance of political, social, and intellectual upheavals in China from 1900 to the present. (Summer)

**120 The Medieval Near East** (3) Andrews
Byzantium and the Islamic World. The Crusades and their consequences. The Mongols, Ottoman Turks, and their neighbors of the 17th century; Eastern and Western perspectives. (Spring)

**121 The Renaissance in Western Europe** (3) Schwoerer
Study of the economic, political, intellectual, and cultural acceleration in Western Europe, beginning in the Italian city-states and spreading to France, Germany, and England, in the 14th through 16th centuries. (Fall)

**122 The Reformation in Western Europe** (3) Herber
Religious, political, and social consequences of the theological upheavals of the 16th century. (Spring)

**123 European Intellectual History I** (3) Kennedy
Popular culture; religion and science in the 17th century; the Enlightenment. Voltaire, Hume, Rousseau, Montesquieu, Beccaria, Diderot, Condorcet on religion, history, nature, society, and politics; the intellectual origins of the French Revolution. (Fall, even years)

**124 European Intellectual History II** (3) Kennedy
Intellectual responses to the French Revolution; 19th-century historical approaches to society, religion, economics, biology, ethics, and psychoanalysis: Hegel, Comte, Marx, Darwin, Nietzsche, and Freud; the intellectual origins of Nazism; literary, artistic, and philosophical responses to World War I. (Spring, odd years)

**125 Women in European History** (3) Schwoerer
A study of the role of women in the political, social, intellectual, and economic life of Europe from the Middle Ages to the 20th century. (Spring)

**128–29 War and Society** (3–3) Allard
How wars, armed forces, and defense policies have affected British and American politics and society. Special attention to the relationship of defense and foreign policy, civil–military relations, the development of strategic thought, and the naval and military influence Britain and America have exerted on each other. Hist 128: 1776–1918. Hist 129: 1919–present. (Academic year)

**131–32 History of Germany** (3–3) Herber
Political, social, and cultural development. Hist 131: From mid-17th century to Bismarck. Hist 132: From William II to the present. (Academic year)

**133 Recent U.S. History, 1890–1941** (3) Ribuffo
Political, social, diplomatic, and intellectual developments, with particular emphasis on the "searching" '20s and New Deal. (Fall)

**134 Contemporary U.S. History Since 1941** (3) Ribuffo
Political, social, diplomatic, and intellectual developments, with particular emphasis on the Cold War, "silent" '50s, and disrupted '60s. (Spring)

**135 History of Soviet Intelligence Services** (3) Dean
The role and impact of intelligence and security operations in Soviet domestic and foreign policy, from 1917 to the present. The course examines the literature and problems of Soviet intelligence operations; Tsarist antecedents: Lenin, the Cheka, and the formative years; operations under Stalin; problems of the post-Stalin years; and operations in the Brezhnev era. Prerequisite: Hist 146 or PSc 131 or 168, or permission of instructor.

**136 Europe in the 20th Century** (3) Sachs
Diplomatic, political, and cultural developments from the turn of the century to the present. (Spring)

**137 U.S.–Soviet Strategic Relations Since World War II** (3) Thomas
Survey of U.S.–Soviet global rivalry from World War II to the present; comparative historical assessment of the changing strategic balance. (Spring)

138 **American Foreign Economic Policy in Historical Perspective** (3) Becker
Historical evolution of United States international economic relations, major issues of foreign economic policy, political problems in policy-making. Emphasis on period since 1945. (Spring)

139–40 **World History in the 20th Century** (3–3) Sachar
Diplomatic, political, and cultural factors. Hist 139: From the turn of the century to the Munich settlement of 1938. Hist 140: From the Munich settlement to the present. (Academic year)

141 **History of France I** (3) Kennedy
Old Regime: Louis XIV, demography, peasants, bourgeois, nobles; Church–Protestant-Jewish relations; salons, Enlightenment, and *philosophes*; literacy and education; Robespierre and Revolution; Napoleon. (Fall, odd years)

142 **History of France II** (3) Kennedy
The Revolutionary tradition and authoritarianism from the Restoration to De Gaulle; the events of 1848, socialism and the class struggle; women, marriage, morals, and population; industrialization and rural France; de-Christianization, Catholic integralism, and worker priests; France's decline as a world power; its intellectual and artistic leadership. (Spring, even years)

145 **Russia to 1801** (3) Atkin
Survey of Russian history from the rise of the Kievan confederation in the ninth century to the establishment of Imperial Russia as a European great power. Attention will be given to the political, socioeconomic, and cultural history of the East Slavs, especially the Russians. (Fall)

146 **Russia and the Soviet Union from 1801 to the Contemporary Era** (3) Atkin
Survey of Russian and Soviet history from the reign of Alexander I to the post-Stalin era. Attention will be given to the contending forces of revolution, reform, and conservatism; diplomatic relations; economic development; social change; and Russian culture. (Spring)

148 **The French Revolution** (3) Kennedy
Social, political, economic, and cultural history of the decade of revolution, 1789–1799. Attention to its structural consequences in France and in Europe at large. (Summer)

149–50 **European Diplomatic History** (3–3) Staff
Emphasis on policies and actions of the great powers and their statesmen, issues of war and peace, international crises, nationalism, alliances, and tensions. Hist 149: 1812 to 1890. Hist 150: Since 1890. Students who receive credit for Hist 150 cannot receive credit for Hist 157. (Academic year)

151–52 **History of England** (3–3) Kenny
Development of English civilization and its impact on Western culture. Hist 151: To 1689. Hist 152: Since 1689. (Academic year)

153 **Tudor England** (3) Kenny
Aspects of the constitutional, social, intellectual, economic, and religious development of England, 1485–1603. (Fall)

154 **Stuart England** (3) Schwoerer
Grand Rebellion, Restoration, and Glorious Revolution. The political, religious, socioeconomic, and intellectual developments in England, 1603–1714. (Spring)

155 **History of Modern Ireland** (3) Kenny
The political and cultural development of Ireland since the Middle Ages and the continuing interaction between Ireland and England, with emphasis on the period from the Act of Union of 1801 to the Partition of 1923

156 **Jewish History from 70 A.D. to 1648** (3) Schroeter
A history of the Jewish people from the destruction of the Temple through the rabbinic and medieval period, with emphasis on contacts with Christian and Muslim communities and cultures. (Fall)

157 **20th-Century European Diplomatic History** (3) Sachar
The main currents, with necessary 19th-century background. Students who receive credit for Hist 157 cannot receive credit for Hist 150. (Fall)

158 **Modern Jewish History** (3) Sachar
A secular history of the Jewish people from the 18th century to the present state of Israel; emphasis on European political, economic, and cultural influences. (Spring)

161 **Revolution in 20th-Century Latin America** (3) Klarén
Examination of the major social revolutions in modern Latin America, especially in Mexico, Cuba, Nicaragua, and Central America; their origins, social composition, leadership, ideology, and programs. (Fall)

162 **20th-Century Latin America** (3) Klarén
A survey of the main societal trends shaping Latin America in this century, with particular emphasis on such themes as populism, urbanization, reformism, modernization, nationalism, Marxism, the military dictatorship, and the development process. (Spring)

163–64 **History of Latin America** (3–3) Klaren
Hist 163: Analysis of Spanish and Portuguese imperialism in the New World, 1492–1820. Hist 164: A problems approach to Latin America, 1820 to the present; thematic emphasis on neocolonialism, corporatism, liberalism, caudillismo, modernization, populism, and revolution. (Academic year)

165 **Latin America and the Industrializing World, 1850–present** (3) Klarén
Examination of the political/diplomatic responses of Latin American nations, individually and collectively, to the expanding industrial powers of the Northern hemisphere in the 19th and 20th centuries, particularly to the United States. (Fall)

167 **Themes in U.S. Cultural History** (3) Gillette
Same as AmCv 167.

169 **The American Revolution** (3) DePauw
The political, intellectual, social, military, and economic impact of the events surrounding the separation of the United States from the British Empire. Special attention to the influence of non-elite groups. (Fall) Hil

170 **U.S. Early National History** (3)
Political, diplomatic, economic, and social history of the early republic, 1787–1828. (Fall) Horton

171–72 **U.S. Social History** (3–3)
Hist 171. Daily life, institutions, intellectual and artistic achievements of the agrarian era, 1607–1861. Hist 172: The urban–industrial era from 1861 to present. Same as AmCv 171–72. (Academic year) Horton

173 **Afro-American History** (3) Horton
Survey of the Afro-American experience, emphasizing the contributions of black Americans to and their impact upon American history. (Fall)

174 **Special Topics in Afro-American History** (3) Horton
Concentration on specific issues central to the Afro-American experience. Consult Spring Schedule of Classes for issues to be addressed. (Spring)

177 **The Jacksonian Era and the Rise of Mass Politics** (3) Horton
The period 1828–1860 and its continuing significance to American society; emphasis on racial and gender divisions and changes in the legal and political systems. (Fall, alternate years)

178 **Making and Braking the Welfare State** (3) Berkowitz
An examination of America's changing approaches to health and welfare problems, explaining the origins of modern entitlement programs and examining ways in which these programs have been adapted and reshaped. Topics such as welfare reform and health insurance are covered. (Spring)

179 **U.S. Economic History** (3) Berkowitz
Survey of American economic history from colonial times to the present. Particular attention is given to the economics of slavery, the development of a national industrial economy, and the growth of the federal government as an influence on economic policy. Same as Econ 179. (Fall) Hil

181–82 **U.S. Diplomatic History** (3–3)
American foreign relations from the era of the American Revolution. Hist 181 to 1898. Hist 182: 20th century. (Academic year)

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
An interdisciplinary examination of the rise of Western individualism from the Renaissance to the American and French Revolutions. Analysis of the tension between reason and religious and popular traditions. Guest lectures by Art, English, Germanic Languages and Literatures, and History faculty. Core course for Early Modern European Studies major but open to other undergraduate and graduate students as well. Same as Engl/Fren/Ger/Rel 183 and Art 187. (Spring)

184 **Civil War and Reconstruction** (3) DePauw
How tensions between the sections developed into violence, how a total war was fought on American soil, and how the experience of war affected the generation that lived through it. (Spring, alternate years)

185 **History of Women in America** (3) DePauw
Survey of the political, economic, social, military, religious, intellectual, and cultural practices in North America from 1000 A.D. to the present as these have affected and been affected by the female half of the population. Same as AmCv 185. (Spring, alternate years)

186 **U.S. Urban History** (3) Gillette
The American city from colonial foundations to the present, relating social and economic forces to physical form. Special emphasis on transitions from pre-industrial to industrial to metropolitan forms, focusing on implications for public policy and historic preservation. Same as AmCv 186. (Fall)

187 **History of Modern China** (3) Johnson
China since 1840, particular attention to political developments. (Fall)

188 **History of Chinese Communism** (3) Thornton
Survey of the leadership, ideology, structure, and foreign and domestic policies of the Chinese Communist Party from its inception to the present. (Fall)

189 **History of Modern Japan** (3) Staff
Japan's century of modernization—from the Meiji Restoration of 1868 to the present. Emphasis on historical, political, economic, and cultural factors. (Fall)

190 **Ethnohistory** (3) Wagner, Humphrey
Same as Anth 190.

191–92 **Senior Honors Thesis** (3–3) Herbst
Required of and open only to undergraduate honors candidates in history. (Academic year)

193 **History of the Near East** (3) Khadduri
Byzantine, Arab, Persian, and Islamic backgrounds; rise and decline of the Ottoman Empire; action of European powers in the area; Ottoman breakup into the Turkish Republic and other states. (Fall, even years)

194 **History of the Modern Near East** (3) Khadduri
Beginning with Napoleon's invasion of Egypt. Development of nationalism and of modern states, impact of the West on culture and institutions, great-power imperialism; crises of Turkish Straits, Suez, Arab–Israeli relations; and other issues. (Fall, odd years)

196 **The Modern Transformation of China and Japan** (3) Johnson
The social, political, and intellectual transformation of China and Japan from the mid-19th century to the present. (Spring)

197 **Oral History and Interview Techniques** (3) Staff
Same as AmCv/Anth 197.

198 **Special Topics in History** (3) Staff
Historical perspectives on great issues of past and present. New topic each semester.

199 **Proseminar: Readings for the History Major** (3) Staff
Required of senior history majors. Readings and discussions on major trends in history; representative selections from the classics of historical literature. Students who receive credit for Hist 199 cannot receive credit for Hist 201. (Fall and spring)

**Third Group**
Any student who has had the appropriate preparation may, with the consent of the instructor, enroll in a third-group course. Enrollment is not restricted to history majors and graduate students. History majors will satisfy the third-group requirement by taking either two courses for research or one course for research and one course for a readings program.

201 **History and Historians** (3) Staff
Historiography and historical method for graduate students. Readings and discussions on major trends in history: selections from classics of historical literature. Students who receive credit for Hist 201 cannot receive credit for Hist 199. (Spring)

203–4 **Seminar: Research or Readings** (3–3) Staff
Offered on demand for individual research programs. Prerequisite: approval of department. (Academic year)

205 **Readings Seminar: Eastern European History, 1772–1918** (3) Staff
Eastern Europe from the partitions of Poland to the end of World War I. (Fall)

206 **Readings Seminar: Eastern European History, 1919–1945** (3) Staff
Emergence of modern East European states after World War I. Developments of the interwar period and World War II. (Spring)

209 **Readings/Research Seminar: Topics in Ancient History** (3) Hadley
Readings on general topics in the history of the ancient Near East, Greece, or Rome. Topics to be announced in the *Schedule of Classes*. Students with working knowledge of the appropriate language(s) may receive research credit.

211 **Readings/Research Seminar: Medieval History** (3) Andrew
Prerequisite: Hist 111–12 or equivalent. Students with working knowledge of Latin may receive research credit. Focus on a particular area and period, with emphasis on interdisciplinary research techniques.

213–14 **History in Public Policy** (3–3) Berkowitz
Seminar in the use of historical insights and methods in policy-making, with emphasis on domestic issues. Assessment and use of primary sources in policy analysis and the use of historical analogy in policy formulation

217 **Readings/Research Seminar: Russian and Soviet Thought** (3) Alke
Selected topics in the intellectual, social, and cultural history of 19th- and 20th-century Russia and Soviet Union.

218 **Readings/Research Seminar: Soviet Nationalities** (3) Alke
An examination of the relationship between the U.S.S.R.'s multinational composition and its domestic political, economic, social, and cultural policies and foreign relations. (Fall)

219 **Internship in History and Public Policy** (3 or 6) Berkowitz
Supervised participation in an office or agency concerned with the formation of public policy; terms of the internship are arranged with the Director of the History and Public Policy Program. Enrollment restricted to students in the History and Public Policy Program. (Fall and spring)

220 **American Business History** (3) Bea
The history of American business institutions in manufacturing, distribution, transportation, and finance. Particular attention will be given to the period since industrialization, with consideration of business institutions in their economic, legal, governmental, and social contexts. Same as BAd 293. (Spring)

224 **Readings/Research Seminar: European Intellectual History** (3) Kenne
Cultural history of the French Revolution. Interrelated changes in political and economic thought, theater, arts, religion, and science from 1789 to 1799. Continuity or discontinuity with pre- and post-revolutionary cultural tra- Gilbe

225 **History of Washington, D.C.** (3)
Same as AmCv 225.

228 **Readings/Research Seminar: Modern Military and Naval History** (3) Staff
Discussion, readings, and research in 20th-century European and American military and naval history.

229 **Seminar: World War II** (3) Staff
Examination of statecraft and the management of force before, during, and after World War II. Special attention to broad aspects of military policy and strategy and their interaction with international politics and diplomacy.

230–31 **Readings/Research Seminar: Strategy and Policy** (3–3) Schlight
Hist 230: A study of the historical development of strategy and the relationship of military thought to national policy. Hist 231: 20th-century strategic thought. (Academic year)

232 **Comparative Communist Systems I** (3) Wolchik
Same as PSc 232.

233 **Comparative Communist Systems II** (3) Wolchik
Same as PSc 233.

237 **Readings Seminar: Soviet Foreign Policy, 1917–1964** (3) Staff
Concepts and perceptions guiding Soviet relations with the outside world. From the blockade and intervention, through years of isolation, World War II, the Cold War, to "peaceful coexistence" and detente. Open to qualified undergraduate seniors. (Fall and summer)

239 **Readings/Research Seminar: Early Modern European History** (3) Schwoerer
Topics selected from Western European history of the 14th through 17th centuries. Readings or research, depending upon students' interests and curricular needs.

241 **Readings/Research Seminar: Modern European History** (3) Herber
Prerequisite: appropriate preparation and consent of instructor

246 **Readings/Research Seminar: History of Modern Russia and Soviet Union** (3) Atkin
Selected topics in the domestic history of modern Russia and Soviet Union. Readings or research, depending upon students' interests and curricular needs. (Fall)

248 **Readings Seminar: Modern Near Eastern History** (3) Staff
Admission by permission of instructor. (Spring)

249 **Research Seminar: European Diplomatic History** (3) Staff
Research seminar in individually selected topics concerning the foreign policies, actions, and interrelations of the European great powers and their statesmen in the 19th or 20th century. Reading knowledge of one language other than English required. (Fall)

250 **Readings Seminar: Issues and Topics in Jewish History** (3) Schroeter
Topics to be announced in the *Schedule of Classes*. (Spring)

251 **Readings/Research Seminar: English People and Institutions** (3) Kenny, Schwoerer
Selected topics in the political, social, intellectual, and economic history of England. Focus upon one time period and special area of interest.

253–54 **Readings Seminar: History of Sino-Soviet Relations** (3–3) Thornton
Seminar designed to develop analytic and historiographic skills. Fall: turn of the century to 1949; spring: Korean War to the present. (Alternate academic years)

255–56 **Readings Seminar: U.S.–Soviet Strategic Relations Since World War II** (3–3) Thornton
Seminar designed to develop a conceptual framework for understanding contemporary U.S.–Soviet relations. Fall: World War II to 1965; spring: 1965 to the present. Hist 255 is prerequisite to Hist 256. (Academic year)

258 **Communist Party of the Soviet Union** (3) Sodaro
Same as PSc 258.

259–60 **Research Seminar: Problems in U.S.–Soviet–Chinese Relations** (3–3) Thornton
Development of scholarly skills through preparation of a research paper.

Prerequisite: Hist 254 or 255 or permission of instructor. (Alternate academic years) Klarén

261 **Readings Seminar: Topics in 20th-Century Latin America** (3)
Admission by permission of the instructor. (Fall) Klarén

262 **Research Seminar: Agrarian Society and Economic Change in Modern Latin America** (3)
Research on the impact of modernity (e.g., foreign capital, immigration, internal migrations, capitalism, imperialism) on traditional rural society. Admission by permission of instructor. (Spring) Horton

271–72 **U.S. Social History** (3–3)
Hist 271: Readings seminar on American daily life, institutions, and intellectual and artistic achievements. Hist 272: Research seminar. Hist 271 is prerequisite to Hist 272. Staff

275–76 **Readings/Research Seminar: U.S. Political and Colonial History** (3–3)
Research or readings, depending on students' interest and curricular needs. Topics on various aspects of the colonial period or political aspects of various periods. Admission by permission of instructor. (Academic year) Longstreth

277–78 **Historic Preservation: Principals and Methods** (3–3)
Same as AmCv/U&RP 277–78. Hill

279 **Readings/Research Seminar: American History** (3)
Readings or research, depending on students' interests and curricular needs. Admission by permission of instructor. (Summer) Hill

281–82 **Readings/Research Seminar: U.S. Diplomatic History** (3–3)
Research or readings, depending on students' interest and curricular needs. Hist 281: 1776–1890; Hist 282: 1890–1950. (Academic year) Ribuffo

283–84 **Readings/Research Seminar: Recent U.S. History** (3–3)
Prerequisite: 6 semester hours of 100-level American history courses. Research or readings, depending on students' interests and curricular needs. DePauw

285 **Readings Seminar: Military and Women's History** (3)
Admission by permission of instructor. (Fall, alternate years) DePauw

286 **Research Seminar: Military and Women's History** (3)
Admission by permission of instructor. (Spring, alternate years) Staff

287 **Seminar: Problems in Latin American Civilization** (3)
Same as IAff 287. Staff

289 **Readings/Research Seminar: Modern Japanese History** (3)
Selected topics in modern Japanese history from the Meiji Restoration of 1868 to the present. Research or readings depending on students' interests and curricular needs. (Spring) Schroeter

290 **Research Seminar: Jews of the Islamic World** (3)
Selected topics in the communal, political, economic, and intellectual history of Jews in lands under Muslim sovereignty. (Fall) Sachar

291 **Readings/Research Seminar: 20th-Century History** (3)
Research or readings on selected topics. (Fall) Sachar

292 **Israel, Zionism, and the Arab World** (3)
Research seminar. (Spring) Johnson Davison

293 **Research Seminar: Modern East Asian History** (3)

294 **Research Seminar: The Modern Near East** (3)
Readings, discussion, and research in selected political, economic, social, cultural, and international developments in the 19th and 20th centuries concerning countries from the Balkans, through Turkey and the Arab countries, to Iran. (Spring) Johnson Staff

295–96 **Readings Seminar: Modern East Asian History** (3–3)

297 **Special Topics Seminar** (3)
Open to doctoral and master's candidates and qualified undergraduates. May be repeated for credit. Offered whenever five or more students can be enrolled.

298 **Dumbarton Oaks Courses** (arr.)
Courses offered each year by scholars in residence at Dumbarton Oaks on

open to qualified graduate and undergraduate students with permission of department chairman. Topics will be announced. May be repeated for credit provided the topic differs.

299–300 **Thesis Research** (3–3)
(Fall and spring) Staff

**Fourth Group**

Prerequisite to all fourth-group history courses: consent of instructor.

Fourth-group history courses are primarily for doctoral students, but master's degree candidates may be admitted.

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in the Institute seminar are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301–14. Students wishing to register for these courses should consult the chairman of the History Department.

301–14 **Folger Institute Seminars** (3 each) Staff
Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

342 **Readings in Modern European History** (3) Staff
From the French Revolution to the period following World War I. (Spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. **(Fall and spring)**

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit.
**(Fall and spring)**

## HUMAN KINETICS AND LEISURE STUDIES

Professors L.M. Stallings, J.L. Breen, D.E. Hawkins, J.E. Snodgrass *(Chair)*, D.C. Paup
Professorial Lecturers C.A. Troester, Jr., R. Anzola-Bentancourt, D.L. Edgell, S. Wahab
Assistant Professor H. Nashman
Assistant Professorial Lecturer G.H. Moeller
Instructors E.C. Rach, P.A. Sullivan, S.E. Spivack *(Visiting)*
Lecturers C.D. Cox, G.V. Swengros, B.J. Westerman, D.W. Rivenburgh, N.B. Smith, R.L. Jarvis, R.L. Harrison, B.M. Dwyer, S.D. Cook, S.A. Schulman, W.D. Wynegar

See the School of Education and Human Development for programs of study leading to the degrees of Bachelor of Science in Human Kinetics and Leisure Studies (with specialization in exercise and sport science and in travel and tourism) and Master of Arts in Education and Human Development (with specialization in exercise science, tourism development and travel administration, and individualized programs in human kinetics and leisure studies).

The University is not responsible for injuries received in any of the activities of the Department of Human Kinetics and Leisure Studies, and the student assumes full responsibility therefor.

### EXERCISE AND SPORT ACTIVITIES

**First Group**

With the exception of students pursuing undergraduate degrees in the School of Education and Human Development, credit for exercise and sport activities courses is not recognized for the baccalaureate. Some exercise and sport activities courses may be repeated for credit by those students who are eligible to receive credit for such courses.

10 **Beginning Badminton** (1) Breen
20 **Beginning Intermediate Golf** (1) Staff
21 **Foil Fencing** (1) Staff
22 **Basketball** (1) Staff

24 **Volleyball** (1) Staff
26 **Karate** (1) Staff
27 **Tennis** (1) Staff
29 **Yoga** (1) Staff
30 **Fitness** (1) Staff
32 **Beginning Swimming** (1) Staff
33 **Swimming/Life Saving** (1) Staff
34 **Intermediate Swimming** (1) Staff
37 **Soccer** (1) Staff
38 **Racquetball** (1) Staff
42 **Aerobics** (1) Staff
43 **Tai Chi** (1) Staff
45 **Experimental Activities** (1) Staff
Topic and amount of laboratory fee (if charged) announced in *Schedule of Classes*. May be repeated for credit.
50 **CPR and First Aid** (2) Staff
Training for certification in cardiopulmonary resuscitation and first aid. Laboratory fee, amount announced in *Schedule of Classes*.
54 **Intermediate/Advanced Tennis** (1 or 2) Staff
Development of skills, theories of strategy; emphasis on competitive play as a lifetime sport.
55 **Swimming—Water Safety Instructor Certification** (2) Staff
56 **Scuba Diving** (2) Staff
Laboratory fee, amount announced in *Schedule of Classes*.
59 **Team Sports** (2) Staff
(Fall)
60 **Racket Sports** (2) Staff
(Spring)
61 **Aquatic Leadership** (2) Staff
(Fall)
62 **Conditioning/Weight Training** (2) Staff
(Spring)
65 **Skiing** (2) (Spring) Staff
Laboratory fee, amount announced in *Schedule of Classes*.
68 **Sport Clinics and Workshops** (1 to 3)
Special intensive study and skill development. There may be a laboratory fee; amount announced in *Schedule of Classes*.

**HUMAN KINETICS** Staff

**Second Group**

101 **Experimental Course** (3) Snodgrass
Topic to be announced in *Schedule of Classes*.
103 **Professional Foundations of Human Kinetics and Leisure Studies** (3) Staff
Nature, scope, and scientific basis of human kinetics and leisure studies; orientation to professional competencies.
111–12 **Sports Education Technique and Analysis** (3–3) Staff
Techniques for teaching individual, dual, and team sports. May be repeated for credit. (Academic year)
122 **Methods and Materials for Health Education** (3) Staff
Conceptual approach to curriculum design and teaching, including planning and organization, methodology, selection and use of materials, and evaluation: basic health knowledge. (Spring)
129 **Introduction to Motor Learning** (3) Staff
Concepts of skill learning applied to teaching, coaching, and performing motor skills. (Fall)
130 **Introduction to Motor Development** (3) Snodgrass
Study of the evolvement and refinement of fundamental movement skills throughout the life span (Fall)

134 **Sports and Nutrition** (3) Stensland
The nutrition needs for recreational exercise and sports; skills in assessing nutrition needs; development of individual nutrition programs that are sport/activity-specific; and identification and correction of nutrition problems affecting sports performance. (Fall)

138 **Organization, Administration, and Management of Physical Education, Sports, and Exercise Programs** (3) Staff
Curriculum, administration, and management related to physical education, sports, and exercise programs.

139 **Principles of Coaching** (3) Sullivan
Study of behavioral patterns and interactions related to individual and team sports. (Spring)

140 **Exercise and Sport Psychology** (3) Sullivan
Study of psychological aspects of athletes, teams, and competition in athletics, including personality, motivation, performance level, achievement, and behavioral change strategies; social factors, training events, and measurement techniques. (Fall)

145 **Working, Stress, and Human Values** (3) Nashman
*(Formerly HKLS 165)*
Recognition, prevention, and control of stress and the burnout syndrome. A humanistic inquiry into values, attitudes, and stressors associated with various professions. Admission by permission of instructor. (Fall)

146 **Stress Management, Burnout, and Human Potential** (3) Nashman
*(Formerly HKLS 166)*
The nature, prevention, and control of the stress and burnout syndrome. Students will design an overall stress management strategy that incorporates achievement of life goals and human potential in a stress-efficient manner. Admission by permission of instructor. (Spring)

150 **Introduction to Human Anatomy** (3) Staff
Systematic study of the structure of the human body, with emphasis on joints, muscles, and neuromuscular mechanisms. (Fall)

151 **Kinesiology** (3) Paup
Analysis of human movement, including mechanical physics, anatomy, and physiology. Prerequisite: an approved course in anatomy. (Spring)

152 **Physiology of Exercise** (3) Paup
*(Formerly HKLS 164)*
The physiological functions of the body and the effect of exercise on these functions. Prerequisite: HKLS 150 or permission of instructor. (Fall)

158 **Safety: Prevention and Care of Sports Injuries** (3) Staff
Safety education, liability, prevention and care of sports injuries; related personnel, facilities, and equipment.

159 **Physical Conditioning and Reconditioning** (3) Staff
The course is designed to provide lectures and lab sessions dealing with upper and lower extremities for injury evaluation techniques, the use of therapeutic modalities, and rehabilitation techniques. Prerequisite: HmKn 158. (Spring)

161–62 **Practicum** (3–3) Nashman, Paup
*(Formerly HKLS 113–14)*
Pre-practice teaching or practical experience in related disciplines. May be repeated for credit. (Academic year)

171 **Senior Seminar** (3) Snodgrass
Study of current literature with implications for human kinetics specializations, use of library resources and retrieval systems, evaluation of professional competencies. Prerequisite: HmKn 103 or permission of instructor.

172 **International Experiences** (1 to 6) Snodgrass and Staff
Travel to a foreign country for study of a specific topic.

173 **Independent Study** (1 to 3) Snodgrass and Staff
Individually designed model for intensive study in an area of special interest. Prerequisite: demonstrated competency for independent work and permission of advisor and instructor. May be repeated for credit.

175 **Student Teaching/Field Experiences** (3 to 9) Nashman, Paup
*(Formerly HKLS 133)*
Prerequisite: HmKn 161–62 or equivalent. Admission by permission of instructor. (Fall and spring) Staff

184 **Workshop** (1 to 3)
Topic to be announced in *Schedule of Classes*. May be repeated for credit with permission of advisor.

**Third Group** Staff

201 **Experimental Course** (3)
Topic to be announced in *Schedule of Classes*. Staff

202 **Motor Learning and Performance** (3)
Variables of perceptual motor learning and performance; theories, concepts and models of learning applied to teaching and coaching. (Fall) Staff

205 **Perceptual–Motor Programs: Diagnostic–Therapeutic Techniques** (3)
Programs of perceptual–motor therapy and their basic assumptions and diagnostic–therapeutic techniques. (Fall) Snodgrass

230 **Advanced Concepts in Motor Development** (3)
Study and practice in techniques of critical observance and analysis of motor behavior throughout the life span, with special emphasis on period from birth to age eight and on the aged. (Spring) Staff

239 **Administration of Therapeutic Recreation Services** (3)
Overview of administrative processes necessary for the development, implementation, and evaluation of therapeutic recreation services for disabled, elderly, and other special populations. Emphasis on administrative competencies in planning, organization, program development, evaluation, and fiscal management. (Spring) Staff

244 **Therapeutic Recreation Practice** (3)
Professional competencies for delivery of therapeutic recreation services to handicapped populations in clinically oriented settings. Emphasis on client assessment, activity analysis, treatment programming, documentation, and relationship of therapeutic recreation to total rehabilitation goals. (Spring) Staff

245 **Medical Aspects of Disabilities and Handicapping Conditions** (3)
Etiology, symptomology, and treatment of chronic and traumatic disorders associated with handicapping conditions; implications for programming and facility development as related to therapeutic recreation, adaptive physical education, and other therapies. (Fall) Staff

251 **Theories and Techniques of Leisure Life-Style Planning** (3)
Overview of theories and concepts of leisure counseling, leisure education, and leisure life-style planning. Emphasis on methods and techniques of leisure assessments and program planning for leisure education. Staff

252 **Supervision in Recreation/Therapeutic Recreation** (3)
Overview of organizational dynamics, group processes, and interpersonal relationships as related to supervision. Theory, discussion, and group experiences in group process and supervisory techniques. Paup

255 **Fitness Evaluation and Exercise Prescription** (3)
Methods and techniques for providing individualized exercise and fitness prescriptions based on measurement and evaluation of physical fitness and health-related variables. Prerequisite: HmKn 150, 152 (Spring) Brey

256 **Sports Medicine** (3)
Theory, practice, and research in diagnostic treatment, rehabilitation, and prevention of sports-related injuries. Swenson

257 **Principles and Concepts of Employee Health Fitness Programs** (3)
General overview of the employee health/fitness movement in the U.S. and other countries. Public and private health policy implications will be analyzed together with national economic and political trends relating to the subject. Evaluation of model programs, procedures, and current practices

259 **Exercise, Stress, and Cardiac Rehabilitation** (3) Gorman
Applied physiology of exercise and psychological stress in relation to coronary artery disease and myocardial infarction; the principles and practice of rehabilitation of patients recovering from a coronary event (heart attack or heart surgery) by exercise therapy and risk-factor reduction. Prerequisite: HmKn 152. (Fall)

280 **Advanced Workshop** (1 to 3) Staff
Workshops with emphasis on contemporary issues and problems; development of advanced professional competencies. May be repeated for credit with permission of advisor. (Fall and spring)

282 **International Experiences** (1 to 6) Staff
May be repeated for credit with approval of advisor.

283 **Practicum** (3 to 6) Breen and Staff
Field work, internship, and/or instructional practice, including conference and/or seminar. May be repeated once for credit with permission of advisor. (Fall and spring)

290 **Advanced Seminar** (1 to 3) Staff
May be repeated for credit with approval of advisor. (Fall and spring)

293 **Independent Study** (1 to 6) Breen and Staff
May be repeated for credit with approval of advisor.

297 **Advanced Topical Studies** (3) Breen and Staff
Independent research and study pertinent to the needs of the student. Prerequisite: Educ 295 or permission of instructor. (Fall and spring)

299 **Thesis Research** (6) Staff

## TRAVEL AND TOURISM

**Second Group**

101 **Experimental Course** (3) Staff
*(Formerly T&T 100)*
Topics announced in the *Schedule of Classes*.

104 **Introduction to Travel and Tourism** (3) Spivack
Survey of the travel and tourism industry with emphasis on marketing tourism and travel, research and development of tourist destinations, and the economic and social impact of tourism. (Fall, spring, and summer)

113–14 **Practicum** (3–3) Hawkins, Rach
Practical experience in travel and tourism related disciplines. (Academic year and summer)

143 **Tourist Accommodations and the Hospitality Industry** (3) Rach
An overview of the basic principles involved in the management, operations, marketing, and financing of hotels, restaurants, and other tourist accommodations, facilities, and services. (Spring)

144 **Tourist Attractions and Activities** (3) Spivack
Basic principles of planning, developing, and managing natural and man-made attractions. National, state, and local park systems, as well as private sector resorts, theme parks, and other tourist attractions are examined. Various recreation activities popular among tourists are examined in view of their personal, economic, social, and environmental impacts. (Spring)

145 **Travel and Tourism Advertising, Public Relations, and Sales Techniques** (3) Staff
Reviews and applies basic advertising, public relations, and sales techniques to the travel and tourism field. Includes study of effective techniques and selected case studies and current practices. (Spring)

146 **Tourist Characteristics and Behavior** (3) Rach
Socioeconomic, demographic, and psychological characteristics of various types of tourist populations. Emphasis on tourist behavior in planning, developing, and marketing tourism programs and services. Cultural differences as they influence travel. (Fall)

147 **Travel and Tourism Transportation Systems** (3) Staff
Overview of the various transportation modes. Planning, financial, operation-

al, marketing, and evaluation aspects of the different systems of transportation. Limited emphasis on the development of travel distribution systems to support specific transportation modes. (Fall) Staff

172 **International Experiences** (1 to 12)
Travel to a foreign country for study of a specific topic. (Fall, spring, and summer) Staff

173 **Independent Study** (1 to 6)
Individually designed model for intensive study in an area of special interest. Prerequisite: demonstrated competency for independent work and permission of advisor and instructor. May be repeated for credit. (Fall, spring, and summer) Staff

178 **Designing and Implementing Conferences and Meetings** (3)
Same as Educ 178. Staff

184 **Workshop** (1 to 6)
Topics announced in the *Schedule of Classes*. May be repeated for credit with permission of advisor. (Fall, spring, and summer) Staff

193 **Domestic and International Tourism Destinations** (3)
Physical and cultural geography of major tourist destinations. Guest-host relationships; information systems.

**Third Group**

201 **Experimental Course** (3)
*(Formerly T&T 200)*
Topics announced in the *Schedule of Classes*. (Fall, spring, and summer) Dwyer

230 **Organization and Management of Airlines** (3)
Overview of domestic and international passenger air transportation system. Analysis of planning, financing, operating, marketing, and evaluating airline transportation systems. Legal and regulatory aspects of airline operation. Attention is devoted to development of infrastructure and related support services. (Summer) Hawkins

249 **Economic, Sociocultural, and Environmental Aspects of Tourism** (3)
Impact of tourism on economic development and cultural values; specific emphasis on psychosocial, physical, and community impacts. (Fall, summer) Schulte

250 **Administration of Travel and Tourism Services** (3)
Organization and management concepts, theories, and issues, stressing application of theory through analysis of short case examples drawn from broader range of the travel and tourism industry. (Fall and spring) Dwyer, Sc

260 **Tourism Development** (3)
Relationship of economic theory and principles to tourism development; applications of financial analysis techniques to the travel and tourism (Fall and spring) Anzola-Betancourt, Wa

261 **Planning for Tourism** (3)
Integrated planning for travel and tourism organizations, financial, physical development for comprehensive tourism projects; considerations, basic concepts, approaches, and models. (Fall and summer) Fa

262 **Tourism Policy Analysis** (3)
Understanding components of tourism policy, development of tools, tourism policy analysis, and description of tourism organizations in government and private sector. (Spring and summer) Dwyer, Wa

263 **Tourism Marketing** (3)
Concepts and techniques employed in marketing travel industry products and services, including its public- and private-sector components. Assessment of the tourism product, development of the marketing strategy, preparation of the marketing plan, and analysis of specific promotional programs. (Fall and spring)

270 **Travel and Tourism Research** (3) Moeller, Cook
Analysis of general research methods and tools and their application to the study of travel and tourism. (Spring and summer)

280 **Advanced Workshop** (1 to 6) Staff
Workshops with emphasis on contemporary issues and problems; development of advanced professional competencies. May be repeated for credit with permission of advisor. (Fall, spring, and summer)

282 **International Experiences** (1 to 12) Staff
Travel to a foreign country for study of a specific topic. May be repeated for credit with approval of advisor. (Fall, spring, and summer)

283 **Practicum** (3 to 6) Hawkins and Staff
Field work, internship, and/or instructional practice, including conference and/or seminar. May be repeated once for credit with permission of advisor. (Fall, spring, and summer)

290 **Advanced Seminar** (1 to 3) Staff
May be repeated for credit with approval of advisor. (Fall, spring, and summer)

293 **Independent Study** (1 to 6) Staff
May be repeated for credit with approval of advisor. (Fall, spring, and summer)

296 **Systems Analysis of Tourism Services** (3) Moeller
Quantitative analysis, resource identification, design techniques, and other systems approaches applied to travel and tourism services. (Fall and summer)

297 **Advanced Topical Studies** (3) Staff
Independent research and study pertinent to the needs of the student. Prerequisite: Educ 295 and T&T 270 or permission of instructor. (Fall, spring, and summer)

299 **Thesis Research** (1 to 6) Staff
Individual research under guidance of a staff member. May be repeated for credit with approval of advisor. Prerequisite: Educ 295 and T&T 270 or permission of instructor. (Fall, spring, and summer)

## HUMAN SERVICES

Professors L. Nadler, C.E. Vontress, L. Winkler, D. Linkowski, E.W. Kelly, Jr., J.C. Heddesheimer (*Chair*), D.W. Dew (*Research*).
Associate Professors P. Finnerty-Fried, C.H. Hoare, G.E. Schou
Assistant Professor N.E. Chalofsky (*Visiting*)
Instructors E. Fabian, T.C. Ginter (*Visiting*), T. Martin

See the School of Education and Human Development for programs of study leading to the degrees of Bachelor of Arts in Education and Human Development, Master of Arts in Education and Human Development, Education Specialist, and Doctor of Education.

### COUNSELING

133 **Supervised Experience in Education and Human Resource Development** (3 to 6) Staff
Fieldwork, internship, and instructional practice. Admission by permission of instructor. (Fall and spring)

162 **Foundations of Counseling** (3) Heddesheimer, Winkler
Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)

163 **Personal and Social Adjustment** (3) Winkler
Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents. (Fall and spring)

193–94 **Research and Independent Study** (arr.) Staff
Individual research under guidance of a staff member. (Academic year)

200 **Special Workshop in Counseling** (arr.)
Topics to be announced in the *Schedule of Classes*. May be repeated for credit.

251 **Foundations of Counseling** (3) Heddesheimer, Winkler
Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)

253 **Counseling Interview Skills** (3) Heddesheimer
*(Formerly Educ 352)*
Acquisition of counseling skills common to all theories through lectures, demonstrations by faculty, role playing, and videotaping. Prerequisite: Educ 251 or permission of instructor. (Fall)

254 **Personal and Social Adjustment** (3) Winkler
*(Formerly Educ 357)*
Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents. (Spring)

255 **Career Development and Information** (3) Vontress
*(Formerly Educ 257)*
Theories of career development; factors influencing the world of work; procedures for evaluating and using personal, educational, and occupational information. Prerequisite: Cnsl 251. (Fall)

257 **Individual Appraisal in Counseling** (3) Winkler
*(Formerly Educ 253)*
Detailed study of individual analysis and appraisal techniques. Development of systematic case study. Prerequisite: Educ 112 or equivalent and Cnsl 251. (Fall)

259 **Theories and Techniques of Counseling** (3) Heddesheimer, Vontress
*(Formerly Educ 258)*
Theories and practices of counseling. Prerequisite: 12 semester hours in counseling, including Cnsl 255 and 257. (Fall and spring)

261 **Counseling in Groups** (3) Heddesheimer, Winkler, Linkowski
*(Formerly Educ 355)*
Principles of group dynamics as related to interaction within groups. Techniques and practice in group counseling. Prerequisite: Cnsl 251; concurrent registration: Educ 258. (Spring and summer) Vontress

263 **Cross-Cultural Counseling** (3)
*(Formerly Educ 354)*
Problems of and procedures for counseling culturally different clients. Emphasis on counseling members of cultural minorities. (Spring and summer) Smith

267 **Foundations of Employee Assistance Programs** (3)
*(Formerly Educ 249)*
History, legislation, and foundations of practice of counseling in employee assistance programs. Finnerty-Fried

269 **Counseling Substance Abusers** (3)
*(Formerly Educ 250)*
Individual, group, family, and self-help counseling applied to substance abusers. Winkler

271 **Family Counseling** (3)
*(Formerly Educ 268)*
The family as a system: how it affects the client and how the client affects it. Didactic presentations, role playing, and work with simulated families. (Spring) Winkler

272 **Human Sexuality for Counselors** (3)
*(Formerly Educ 267)*
The purpose of this course is to increase the awareness and understanding of sexuality as it relates to counseling in contemporary society. (Fall) Finnerty-Fried

274 **Counseling Older Persons** (3)
*(Formerly Educ 353)*
Special considerations and counseling emphases in regard to the life transitions and role changes that occur for older persons. (Summer)

276 **Foundations of Rehabilitation** (3) Staff
*(Formerly Educ 365)*
Survey of history, philosophy, legislation, roles, and services. Visits to selected field sites. (Fall)

278 **Psychosocial Aspects of Disabilities** (3) Linkowski
*(Formerly Educ 363)*
Impact of disabilities and concept of normalization. (Fall)

280 **Job Development and Placement** (3) Finnerty-Fried
*(Formerly Educ 360)*
Job development and modification: placement of disabled persons. (Spring)

281 **Medical Aspects of Disabilities** (3) Linkowski
*(Formerly Educ 361)*
Chronic and traumatic disorders with rehabilitation implications. (Fall)

284 **Practicum in Counseling and Human Development** (3) Staff
*(Formerly Educ 261)*
First half of two-semester clinical experience for degree candidates in counseling. Admission by permission of instructor. Prerequisite: Cnsl 251, 253, 255, 257, and 259.

285 **Internship in Counseling and Human Development** (3) Staff
*(Formerly Educ 262)*
Second half of two-semester clinical experience for degree candidates in counseling. Admission by permission of instructor. Prerequisite: Cnsl 284.

293–94 **Research and Independent Study** (1 to 3) Staff
Individual research under guidance of a staff member. Program and conferences arranged with an instructor. (Academic year)

298–99 **Thesis Research** (3–3) Staff
*(Formerly Educ 299–300)*
Required of M.A. in Ed.&H.D. degree candidates writing master's theses. (Fall and spring)

352 **Organization and Administration of Counseling Services** (3) Vontress
*(Formerly Educ 252)*
Principles and procedures for designing and implementing counseling services. Admission by permission of instructor. (Spring)

358 **Advanced Theories of Counseling** (3) Vontress
Critical analysis and evaluation of leading counseling theories and consideration of their implications for practice. Intended for Education Specialist and Doctor of Education degree candidates whose area of concentration is counseling. Admission by permission of instructor. (Fall)

359–60 **Doctoral Internship in Counseling** (3–3) Heddesheimer
*(Formerly Educ 441–42)*

361 **Seminar: Counseling** (arr.) Staff
*(Formerly Educ 443)*

391 **Dissertation Research** (arr.) Staff
*(Formerly Educ 491)*
Preparation of a research outline: research and writing of an approved doctoral dissertation under the direction of major advisor and dissertation committee. Prerequisite: Educ 390.

## HUMAN RESOURCE DEVELOPMENT

133 **Supervised Experience in Education and Human Resource Development** (3 to 6) Staff
Fieldwork, internship, and instructional practice. Admission by permission of instructor. (Fall and spring)

178 **Designing and Implementing Conferences and Meetings** (3) Nadler
Same as T&T 178. Use of design committees, steering committees, selection of resource people, site selection, exhibits, and relation to supplier personnel. Special attention to designing the core of the conference and related conference activities. (Summer)

180 **Facilitating Adult Learning** (3) Staff
*(Formerly Educ 380)*
Emphasis on developing and/or improving skills in formal instruction, using a wide variety of instructional strategies in adult learning situations. (Summer)

193–94 **Research and Independent Study** (arr.) Staff
Individual research under guidance of a staff member. (Academic year)

200 **Special Workshop in Human Resource Development** (arr.) Staff
Topics to be announced in the *Schedule of Classes*. May be repeated for credit.

236 **Technical Programs in Human Resource Development** (3) Staff
Analysis of the nature and scope of human resource development technical training in industry, government organizations, and labor unions. (Fall)

237 **Designing Technical Training Programs** (3) Staff
Applications of performance-based, criterion-referenced design models for technical skills training programs. (Spring)

239 **International Programs in Adult Learning** (3) Staff
The use of adult learning programs (adult education, human resource development, higher education, etc.), in various parts of the world, as provided by international agencies, multinational companies, and public foundations. Emphasis on national development, social problems, economic growth. (Spring)

263 **Human Resource Development** (3) Nadler and Staff
Concepts and purpose, historical backgrounds, roles of human resource development personnel, program areas. Prerequisite: adequate professional preparation or experience in training, education, and development. (Fall and spring)

264 **Design of Training Programs in Human Resource Development** (3) Nadler and Staff
Training, education, and development programs for various client systems will be planned using the critical-events conceptual model. Fieldwork. Prerequisite: HRD 263 and permission of instructor. (Fall and spring)

272 **Internship in Adult Learning and Human Resource Development** (3 to 6) Nadler and Staff
*(Formerly Educ 372)*
Supervised experience in selected areas of: human resource development, adult education. Admission by permission of instructor. (Spring)

279 **Adult Education**(3) Hoare
Current concepts and objectives, historical development, agencies involved, personnel, clients, programs on all levels—community through international. (Fall)

280 **Program Planning in Adult Education** (3) Staff
Determining educational needs for adults in school and nonschool agencies, designing programs and instruction; budgeting and scheduling of adult programs. Field work with sponsoring agency. Prerequisite: Educ 279 and permission of instructor. (Spring)

281 **Adult Learning** (3) Hoare and Staff
*(Formerly Educ 381)*
Learning theories as applied to adults in individual and group learning transactions; effect of age on learning; psychological, physical, and social environment in adult education situations. (Fall and summer)

282 **Instructional Strategies in Adult Learning Programs** (3) Greenberg and Staff
*(Formerly Educ 382)*
Methods, techniques, and devices for adult learning; developing activity-oriented learning situations in adult learning programs. (Fall and spring)

283 **Interviewing/Counseling for Human Resource Developers** (3) Staff
*(Formerly Educ 383)*
Applications of interviewing, coaching, and counseling skills for the human resource development specialist and others in various occupational settings.

284 **Evaluation of Adult Learning Programs** (3) Staff
*(Formerly Educ 384)*
Evaluation design strategies for adult learning programs in business, industry, government, voluntary and community organizations, and agencies. (Fall)

286 **Current Issues in Adult Learning Programs** (3) Nadler and Staff
*(Formerly Educ 386)*
Current issues and trends in the fields of adult education and human resource development. (Spring and summer)

287 **Management of Adult Learning Programs** (3) Staff
*(Formerly Educ 387)*
Program administration in school and nonschool agencies, staff recruitment and development, fiscal operations, facilities, and maintenance of effective community relations. (Spring)

289 **Consultant–Client Relationships in Human Resource Development** (3) Staff
*(Formerly Educ 389)*
Examination of the consulting process, consultant–client behaviors, and dilemmas, using theory and field experience for individual and organizational development. Prerequisite: Educ 263, 279; or approval of instructor. (Fall and spring)

293–94 **Research and Independent Study** (1 to 3) Staff
Individual research under guidance of a staff member. Program and conferences arranged with an instructor. (Academic year)

299–300 **Thesis Research** (3–3) Staff
Required of M.A. in Ed.&H.D. degree candidates writing master's theses. (Fall and spring)

321 **Seminar: Adult Education** (arr.) Nadler
*(Formerly Educ 421)*

327 **Seminar: Human Resource Development** (arr.) Nadler
*(Formerly Educ 427)*

379 **Practicum in Adult Learning Programs** (3 to 6) Nadler
Supervised practical experience in various forms of adult education and human resource development. Admission by permission of instructor. (Fall and spring)

391 **Dissertation Research** (arr.) Staff
*(Formerly Educ 491)*
Preparation of a research outline; research and writing of an approved doctoral dissertation under the direction of major advisor and dissertation committee. Prerequisite: Educ 390.

## HUMAN SERVICES

75 **Introduction to Rehabilitation** (3) Finnerty-Fried
Overview of rehabilitation profession, including philosophy, history, ethics, legislation, settings, and practice. (Fall)

133 **Supervised Experience in Education and Human Resource Development** (3 to 6) Hoare
Fieldwork, internship, and instructional practice. Admission by permission of instructor. (Fall and spring)

176 **Program Planning and Development for Service Agencies** (3) Ferrante, Hoare
Examination of program planning and development activities essential to human service agencies. Through case studies and on-site field experiences, students examine and analyze a variety of processes in which agency needs are assessed and programs planned. (Spring)

182 **Organization and Administration in the Human Services** (3) Hoare and Staff
Introduction to organizational theory and program administration in nonschool agencies, staff recruitment and development, fiscal operations, person-

nel and program supervision, facilities, and maintenance of effective community relations. (Spring) Staff

193–94 **Research and Independent Study** (arr.)
Individual research under guidance of a staff member. (Academic year) Staff

195 **Seminar in Human Services: Current Issues** (3)
Analysis of selected issues in human services. Each student conducts an investigation of an identified problem in human services and completes a skill assessment project. Admission by permission of instructor. (Spring) Staff

200 **Special Workshop in Human Services** (arr.)
Topics to be announced in the *Schedule of Classes*. May be repeated for credit.

## HUMANITIES

**Humanities Steering Committee**
J.A.A. Plotz (*Coordinator*), J. Butler, G. Carter, R.P. Churchill, E.A. Fisher, N.N. Natov, J.F. Thibault, D.D. Wallace

Columbian College of Arts and Sciences offers a set of interdisciplinary courses designed to provide a coherent introduction to classic works in the humanities. The courses deal with historical figures, creative works of art and literature, systems of philosophy, and religious traditions that are the common property of educated people. The full interpretation of these fundamental sources of Western culture requires the collaboration of faculty from all disciplines of study encompassed in the humanities.

Columbian College students may use up to 6 semester hours of these courses toward the fulfillment of the meaningful initiation requirement in the humanities.

1 **Roots of the Western Tradition** (3) Staff
Basic ideas of Western thought from early Greek, Roman, Judaic, and Christian traditions. Representative readings in drama, epic, historical writings, oratory, creation stories, scriptural traditions, philosophy, and spiritual autobiography. Most sections are to be taken in conjunction with Engl 1. (Fall and spring) Staff

2 **Ideas in Western Culture: Aquinas to Voltaire** (3)
An examination in historical context of central texts from the Middle Ages, the Renaissance, and the Enlightenment: Aquinas, Dante, Machiavelli, Erasmus, Luther, Montaigne, Bacon, Shakespeare, Rabelais, Descartes, Milton, Locke, and Voltaire. (Spring) Staff

3–4 **Studies in 19th-Century Culture** (3–3)
Through study of representative works of European and American art, music, literature, drama, philosophy, and theology, students are introduced to major themes of 19th-century culture and are initiated into the methods of analysis and interpretation characteristic of the different disciplines within the humanities. The 19th-century resources of Washington form part of the curriculum. (Academic year)

43–44 **Classical Humanities** (3–3)
Lectures in the origins and development of Western civilization from approximately 3000 B.C. to 1300 A.D. Hmn 43 considers the civilization of the Old Testament period and of Classical Greece through readings in the Old Testament and in Homer, Aeschylus, Sophocles, Euripides, Aristophanes, Herodotus, Thucydides, Plato, and Aristotle. Hmn 44 considers the civilization of the Roman Empire and of medieval Europe through readings in Virgil, Tacitus, St. Augustine, Aquinas, and Dante, and in medieval romance. Offered off campus only.

45–46 **Humanities in the Modern World** (3–3)
Lectures in the development of Western civilization from the 14th to the 20th centuries. Hmn 45 considers Renaissance and Neoclassical culture through readings in Machiavelli, Cellini, Shakespeare, Cervantes, Bacon, Moliere,

Voltaire. Hmn 46 considers aspects of Romanticism and Modernism manifested in works by Goethe, Flaubert, Zola, Nietzsche, Mann, Chekhov, and Joyce. Offered off campus only.

## INDIVIDUAL GRADUATE PROGRAMS

**Committee on Individual Programs**
C.E. Rice (*Program Director*), A.D. Andrews, B.L. Catron, J.J. Cordes, W.B. Griffith, T.L. Hufford, P.H.M. Lengermann

The Graduate School of Arts and Sciences offers the course listed below primarily for students with individualized interdisciplinary programs of study for the master's degrees. The Committee on Individual Programs, which has supervisory responsibility for Individual Programs students, provides the faculty for the Colloquium.

250 **Colloquium on Interdisciplinary Methodologies** (3) Staff
Analysis from several perspectives of the problems inherent in interdisciplinary study and research, conditions that justify interdisciplinary work, norms and strategies for success, and case studies. (Offered as the demand warrants)

## INTERNATIONAL AFFAIRS

The School of International Affairs offers a multidisciplinary program leading to the degrees of Bachelor of Arts and Master of Arts in the field of international affairs. The program provides students with a broad background in the general areas of international affairs as well as opportunities to specialize in one of the traditional disciplines or in a regional area.

Bachelor of Arts with a major in international affairs—The following requirements must be fulfilled.

1. The general requirements stated under the School of International Affairs.
2. Prerequisite courses—see the School of International Affairs, Curriculum Requirements.
3. Required courses for the major—Econ 181–82; the third year of study of a foreign language (may be literature courses taught in the language); one course selected from Geog 132, 133, 134, 135, 145, 146, 147, or 154; Hist 182 and one course selected from Hist 136, 150, or 157; PSc 140 and either 142 or 144.
4. Fifteen semester hours of additional course work must be selected from one of the following group options (courses taken in fulfillment of required courses for the major may not be applied to the selected group option).

International politics—courses concerned with theory and practice in international affairs, forces shaping the world scene, and U.S. foreign policy, selected from Geog 127, 133, 137, 146, 147; Hist 137, 139–40, 149; PSc 105, 106, 107, 108, 130, 131, 142, 144, 146, 149, 161, 178, 182, 183, 184, 186, 191, or 192.

International economics—courses concerned with the world economy and U.S. policy and practice in international trade and finance, selected from BAd 160, 166, 173; Econ 101, 102, 104, 121, 122, 134, 147, 151; Geog 125, 127, 133, 134, 135; Stat 111, 112.

International communications—courses concerned with the study of international information programs, public opinion, psychological warfare, cultural relations, and public relations, selected from Anth 150, 153, 157, 161, 162, 168; Geog 125; Jour 145, 146; Jour/PSc 128; PSc 120, 129, 146, Psyc 115, 151, 156.

Regional study—a concentration in one of the following areas.

Africa—courses selected from Anth 178; Geog 154; Hist 116; PSc 180, 181, 182.

Europe—courses selected from Econ 147; Hist 128–29, 131–32, 141–42, 147, 149, 151–52, 158; PSc 105–6, 130, 131, 161.

Far East—courses selected from Anth 173, 175; Chin 163–64, 181, 182; Econ 169, 170; Geog 266; Hist 137, 187, 188, 189, 196; Japn 111–12; PSc 105, 170, 173.

Latin America—courses selected from Anth 170, 172, 185; Econ 185; Geog 161; Hist 161, 162, 163–64, 165; IAff 287; PSc 183, 184.

Middle East—courses selected from Anth 177; Geog 154; Hist 158, 193, 194; PSc 177, 178, 179, 180; Rel 161.

*Soviet Union and Eastern Europe*—courses selected from Econ 133, 134; Geog 265; Hist 137, 145, 146, 188; PSc 108, 131 or 165, 168; Slav 161–62, 165, 166.

*Master of Arts in the field of international affairs*—This multidisciplinary program offers a wide choice of subject emphasis within the three broad categories of general fields, supplementary fields, and regional fields. Graduate courses in anthropology, business administration, economics, geography and regional science, history, political science, psychology, and sociology are applicable to the fields.

Prerequisite: the admission requirements stated under the School of International Affairs. Required: the general requirements stated under the School of International Affairs. All degree candidates must select at least one general field from those listed below. Candidates who select a 36-semester-hour program without a thesis must choose four fields and may take no more than 21 hours in one department; the program must include at least two research seminars requiring the preparation of substantial research papers. Candidates who select a 30-semester-hour program with a thesis must choose three fields and, in addition to thesis research, must take a minimum of 24 semester hours of graduate course work in at least two departments, with no more than 15 hours in any one department.

Beyond these limits, students are free to select any of the fields listed below, so long as they comprise a coherent program. Courses should be chosen with a view to their relevance to the selected fields. Candidates will be examined on their selected fields in the Master's Comprehensive Examination.

*General fields*—At least one general field must be chosen from international politics (PSc 240 and 241), comparative politics (PSc 230 and 231), modern political theory (PSc 205 and either 206 or 207), and international economics (Econ 281–82 or 283–84).

*Supplementary fields*—Fields regularly offered include international law, international organization, international economic development, comparative aspects of communism, U.S. diplomatic history, U.S. foreign policy, U.S. foreign economic policy, history of strategy and policy, national security policy, and science, technology, and public policy.

*Regional fields*—Western Europe, Eastern Europe, Soviet Union, Middle East, Africa, South and Southeast Asia, China, Japan, and Latin America (for each geographic region, courses are generally available in modern history, government and politics, and economic problems).

91 **East Asia–Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course offering a comprehensive and integrated introduction to the civilization and present problems of East Asia. (Spring)

156 **InterFuture: Independent Study Abroad** (15) None
Comparative research in the United States and one or two other countries included in the InterFuture program. InterFuture scholars are selected on the basis of academic record and aptitude for independent research in a foreign environment. Enrollment limited to SIA juniors. (Spring)

190 **Special Topics in International Affairs** (3) Staff
Courses designed to focus on international affairs issues of a more current and topical nature. Topics announced in the *Schedule of Classes*. (Fall and spring)

195 **Internship: International Affairs** (1 to 6) Staff
Faculty-supervised internships in the Department of State, Organization of American States, and other agencies concerned with international affairs. Admission by permission of instructor. (Fall, spring, and summer)

287 **Problems in Latin American Civilization** (3) Klaren and Associated Faculty
Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor (Fall and spring)

290 **Special Topics in International Affairs** (3) Staff
Courses designed to focus on international affairs issues of a more current

topical nature. Topics announced in the *Schedule of Classes.* (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall, spring, and summer)

## ITALIAN

See **Romance Languages and Literatures.**

## JAPANESE

See **East Asian Languages and Literatures.**

## JOURNALISM

Professor P. Robbins (*Chair*)
*Professorial Lecturers* F.L. Dennis, J. Goldsmith, L.B. Laurent
*Associate Professors* R.C. Willson, C.W. Puffenbarger (*Visiting*)
*Associate Professorial Lecturers* J.P. McGill, W.R. Fonda, R.R. Mueller, T.O. Cron, D. Haun, J.R. Fogarty, D.L. Smith
*Assistant Professorial Lecturers* E.B. Feldman, M.C. Sheward

*Bachelor of Arts with a major in journalism (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students planning to major in journalism should take Engl 11 rather than Engl 12 in satisfying the English composition requirement.)
2. Prerequisite courses—Engl 51–52 or 71–72; Jour 71–72; PSc 1 and 2.
3. Required courses in the major—24 hours of second-group courses in Journalism, including (a) Jour 111, 196, 198; (b) 9 semester hours chosen from Jour 121, 125, 133, 135, 137, 138, 139, 151, 155; and (c) 6 semester hours chosen from Jour 115, 116, 117, 128, 129, 140, 141, 142, 145, 146, 150, 170, 190, 199.
4. Required as a secondary area of concentration—a minimum of 18 semester hours of second-group courses, chosen in consultation with the major advisor, in one other department or field of study.

Recommended electives: Econ 121, 142, 157, 161, 162, 181–82; PSc 110, 111, 112, 114–15, 116, 118, 119, 120, 122; Psyc 115; Comm 132, 133, 134, 135–36, 145; Stat 53, 105, 129.

*Minor in journalism*—The student must complete 21 semester hours in journalism, including Jour 71 or 72; Jour 111; one course selected from Jour 115, 116, 117, or 170; three courses selected from Jour 121, 125, 133, 135, 137, 138, 139, 151, or 155; and any one other journalism course.

*Special Honors*—Senior journalism majors with a grade-point average of 3.5 in at least five second-group journalism courses may apply for special honors at the start of the senior year with submitted proof of ability in print or broadcast professional media. They then must complete degree requirements with grades of *A* or *B* in at least 50 percent of all work done at this institution, must earn a quality-point index of at least 3.5 for all second-group journalism courses taken, and, four weeks before expected graduation, must submit to the department published or broadcast professional work completed during the senior year.

**Departmental prerequisite:** Jour 111 and permission of the department are prerequisite to Jour 115, 125, 133, 135, 137, 138, 139, 151, 155, 190, and 196.

**First Group**

71–72 **Introduction to Mass Communication** (3–3) Willson
Jour 71: Study of U.S. news media from colonial times to the present, with consideration of political, social, and economic developments. Strong emphasis on media relations with government and on the evolving concept of

freedom of the press. Jour 71 can be taken concurrently with Jour 111. Those who lack knowledge of U.S. history should take Hist 71–72 before taking Jour 71. Jour 72: The U.S. press, radio, television, and other mass media today. Problems of monopoly, libel, government regulation, ethics, and news media responsibility. Brief survey of news media operations and press freedom in other nations. Jour 72 may be taken before Jour 71. (Academic year)

**Second Group**

111 **Reporting** (3) Robbins, Puffenbarger
Gathering information, evaluating it, and writing news and feature stories with emphasis on print media. Historical, ethical, and legal perspectives of journalistic reporting. Laboratory writing and live reporting assignments on campus and within the metropolitan area, with concentration on government and politics. Typing required. Freshmen must obtain departmental permission before enrolling. Laboratory fee, $10. (Fall and spring)

115 **Newspaper Editing and Make-up** (3) Puffenbarger
Modern newspaper design and the editing and page layout process. Practice work in selecting and editing stories for publication; writing headlines and photo captions; selecting, sizing, and cropping photos and other graphic materials; and laying out pages. Procedures and ethics for editors and designers. Prerequisite: Jour 111 or permission of the department. (Fall and spring)

116 **Magazine Layout and Design** (3) Smith
Layout, typography, and design for magazines, newsletters, house organs, and similar publications for associations, institutions, and industry. (Fall)

117 **Magazine Editing** (3) Staff
The editor's responsibility to publisher and readers. Setting the editorial goals and planning content and production to meet them. Editing copy for general and specialized magazines. (Spring) Wilson

121 **Feature Writing** (3)
Free-lancing nonfiction articles; obtaining materials through independent investigation. Permission of the instructor required. (Fall and spring) Staff

125 **Science Writing** (3) Staff
Writing science news for the mass media. (Spring)

128 **Government Process and the Media** (3)
Examination of the roles played by the news media that affect the political process, including the impact the media have on the Presidency, Congress, and the bureaucracy, and the adequacy of news organizations to provide information and analysis needed by citizens to exercise effective control of government. Same as PSc 128. (Fall and spring) Lacy

129 **TV News: The Politics of Visibility** (3)
Same as Comm/PSc 129. Puffenbarger (Fall or

133 **Advanced Reporting: Public Affairs** (3)
Coverage and writing of local and state governmental news. (Fall or spring)

135 **Advanced Reporting: Consumer Affairs** (3)
Specialized training in the consumer news field. (Fall) Fogarty

137 **Advanced Reporting: National Affairs** (3)
Coverage and writing of federal government news. (Fall) Puffenbarger

138 **Investigative Reporting** (3)
In-depth reporting in selected areas of political, economic, and social affairs. Prerequisite: Jour 133 or permission of instructor. (Spring) Fellow (Fall

139 **Advanced Reporting: Radio and Television News** (3)
Preparing news and public affairs programs for broadcast media. Fo spring)

140 **Photojournalism** (3)
Taking and processing photographs for publication, picture selection, cropping, captions. Students must purchase their own film and print pap

Laboratory fee, $54. Students who received credit for Art 23 or 24 cannot receive credit for Jour 140. (Fall and spring)

141 **Intermediate Photojournalism** (3) Haun
Advanced news and feature photography, editing, layout and photo essays. Students must purchase their own film and print paper. Laboratory fee, $54. Prerequisite: Jour 140 or Art 23 and 24. (Fall and spring)

142 **Advanced Photojournalism** (3) Staff
Picture stories and photo essays in black and white or color; emphasis on layout, captions, text. Students must purchase own film and print paper. Laboratory fee, $54. Admission by permission of instructor. (Spring)

145 **Principles and Problems of Public Relations** (3) McGill, Mueller, Sheward
Principles, problems, and ethics of public relations for government agencies, commercial establishments, educational and other public institutions. Case histories of successful programs. (Fall and spring)

146 **Government Information** (3) Staff
Growth of information activities in government and the role of the information specialist. Writing and editing for government information operations. (Spring)

150 **News Coverage in Washington** (3) Puffenbarger
The Washington news beats, channels and sources of news in the nation's capital, uses and abuses of the media. Field trips to local news centers and press briefings.

151 **Editorial Writing** (3) Robbins
Techniques of editorial writing, conducting the editorial page, function of editorials and columns of news commentary in a free press. Permission of the instructor required. (Spring)

155 **Critical Writing and Reviewing** (3) Laurent
Reviewing and commenting on the arts and entertainment for the mass media. (Spring)

170 **News Publication Management** (3) Coldsmith
The business side of publishing. Study of the roles of advertising, circulation, promotion, accounting and administration, and mechanical departments in newspapers and other publications. (Spring)

190 **Internship in Journalism** (3) Staff
Study of a journalistic medium in action by working in a Washington area news office. Admission restricted to senior journalism majors selected by a departmental committee. (Fall and spring)

195 **Documentary Photography** (3) Staff
Same as Art 195. Laboratory fee, $54.

196 **Senior Project** (3) Staff
Open only to journalism majors. Major journalistic effort undertaken in consultation with a member of the journalism staff. A written request describing the project must be presented to the staff member for approval and filed with the student's advisor in the semester before registration. (Fall and spring)

198 **Law of the Press** (3) Dennis
Freedom of the press, censorship, legislative controls, publication as contempt of court, copyright, news-gathering agencies, labor law and the newspaper business, law of libel, privileged matter, fair comment on public characters, right of privacy. (Fall)

199 **Special Topics in Journalism** (3) Staff
Selected topics: writing, editing, graphics, photojournalism, or other aspects of communication. May be repeated for credit.

## JUDAIC STUDIES

**Committee on Judaic Studies**
M. Ticktin (Chair), B. Reich, H.M. Sachar, H.E. Yeide, Jr.

Columbian College of Arts and Sciences offers an interdisciplinary program in Judaic Studies leading to the degree of Bachelor of Arts. This program is intended for students who wish to investigate the history, language, literature, religious and philosophical thought, and political and social experience of the Jewish people from the perspective of several academic disciplines. (Students who wish to concentrate on the religious aspects of Judaism and its relationship to the other religious traditions of the world may prefer to elect a major in religion with an emphasis on Judaism (see Religion).)

*Bachelor of Arts with a major in Judaic studies (interdepartmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Clas 21–22, 23–24; Rel 9, 23.
3. Required courses for the major (30 semester hours):
   (a) Clas 103 or 104; Hist 158; PSc 179; Rel 113–14 or 115–16, 213 or 238.
   (b) two meaningfully related courses selected from each of two of the following groups: I—Anth 3, 177; Art 111, 112; II—Clas 100, 101, 102; Engl 175; III—Hist 107, 108, 110, 113, 114, 121, 122, 123, 124, 139, 140, 156, 171, 172, 193, 194, 250, 290, 292, 294; IV—Phil 111, 112, 113, 127, 131, 172; V—Geog 154; PSc 126, 177, 178, 277, 278, 290; VI—Rel 103, 104, 105, 107, 111, 122, 126, 137, 143, 144, 145, 146, 161, 162, 172, 174, 181, 184, 209, 291, 292.

Students applying for the 90-hour degree program in Judaic studies must, in addition to meeting the general requirements stated under Columbian College of Arts and Sciences, present evidence of exceptional preparation in the field of Judaism, provide strong recommendations from high school teachers and/or counselors, and complete a satisfactory interview with the Committee on Judaic Studies.

*Minor in Judaic studies*—Required: A minimum of 18 semester hours, chosen in consultation with an advisor designated by the Committee on Judaic Studies, from Clas 21–22, 23–24, 25–26, 100, 101, 102, 103, 104; Hist 156, 158; PSc 179; Rel 9, 23, 103, 107, 113, 114, 115, 116, 174, 184, 209, 213, 238.

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The courses listed below represent the core of the Judaic Studies curriculum available for undergraduate and graduate students:

| | |
|---|---|
| Clas 21–22 | *Beginning Hebrew* |
| Clas 23–24 | *Intermediate Hebrew* |
| Clas 25–26 | *Yiddish for Reading and Conversation* |
| Clas 100 | *Modern Hebrew Literary Classics* |
| Clas 101 | *Israeli Society and Culture: Literary Perspectives* |
| Clas 102 | *Contemporary Israeli Short Stories and Poetry* |
| Clas 103 | *Modern Hebrew Nonfiction* |
| Clas 104 | *Modern Hebrew Fiction* |
| Clas 185–86 | *Directed Reading* |
| Hist 156 | *Jewish History from 70 A.D. to 1648* |
| Hist 158 | *Modern Jewish History* |
| Hist 250 | *Readings Seminar: Issues and Topics in Jewish History* |
| Hist 290 | *Research Seminar: Jews of the Islamic World* |
| Hist 292 | *Israel, Zionism, and the Arab World* |
| Hmn 1 | *Roots of the Western Tradition* |
| PSc 176 | *The Arab–Israeli Conflict* |
| PSc 179 | *Israeli Politics and Foreign Policy* |
| Rel 9 | *The Hebrew Scriptures* |
| Rel 23 | *Judaism: Identities and Ideas* |
| Rel 103 | *The Prophets* |
| Rel 107 | *Rabbinic Literature and Thought* |
| Rel 113 | *Early Post-Biblical Judaism* |
| Rel 114 | *Judaism in the Rabbinic Period* |
| Rel 115 | *Judaism in the Medieval World* |
| Rel 116 | *Judaism After Emancipation* |

Rel 137 *The Land of Israel and the Growth of Western Religions*
Rel 174 *American Judaism*
Rel 184 *The Thought of Martin Buber*
Rel 209 *Seminar: Biblical Studies*
Rel 213 *Seminar: Judaism in Late Antiquity*
Rel 238 *Seminar: Contemporary Judaism*
Rel 291–92 *Readings and Research*

## KOREAN

See **East Asian Languages and Literatures.**

## LATIN

See **Classics.**

## LATIN AMERICAN STUDIES

Program Committee: P.F. Klaren (*Director*), C.J. Allen, D.A. Caro, M. Gordon, C. McClintock, J.W. Robb

The School of International Affairs offers multidisciplinary programs leading to a Bachelor of Arts with a major in Latin American studies and to a Master of Arts in the field of Latin American studies.

*Bachelor of Arts with a major in Latin American studies*—The following requirements must be fulfilled.

1. The general requirements stated under the School of International Affairs.
2. Prerequisite courses—see the School of International Affairs, Curriculum Requirements.
3. Required courses for the major—Anth 172 or 185 or 190; Econ 185; Geog 161; Hist 163–64; IAff 287; PSc 183, 184; Span 1–2–3 and 4 or equivalant (Span 9–10 is recommended) and two courses selected from Span 151–52, 155–56, 157–58, or other approved courses in Spanish literature.
4. Fifteen semester hours of additional course work must be taken in one of the following Departments: Anthropology, Economics, Geography and Regional Science, History, Political Science, and Romance Languages and Literatures (courses in Hispanic literature).
5. Students who plan to apply for graduation with Special Honors must take a research course in the field of concentration and complete an independent study project with distinction.

*Master of Arts in the field of Latin American studies*—Prerequisite: the admission requirements stated under the School of International Affairs. Required: the general requirements stated under the School of International Affairs.

The program offers a 30-semester-hour option with a thesis or a 36-semester-hour option without a thesis. All students must take the interdisciplinary seminar, IAff 287, Problems in Latin American Civilization. (Students with no previous course work in Latin American history, politics, literature, geography, or anthropology should consult with the program director to determine ways to acquire the necessary background.)

All students must demonstrate proficiency in Spanish or Portuguese through a reading comprehension examination. For students whose native language is Spanish or Portuguese, an English language examination will be substituted.

Degree candidates who choose the thesis option must take Master's Comprehensive Examinations in three fields. This can include one major field (12 semester hours, including IAff 287) and two minor fields (6 semester hours each), or it can be two major fields (9 semester hours each) and one minor field.

Those who select the nonthesis option must take Master's Comprehensive Examinations in four fields, which can include one major field (12 hours) and three minor fields (6 hours each) or two major fields (9 hour each) and two minor fields (6 hours each). One

minor field may be selected from demography, international business, rural development, urban and regional planning, tourism development and travel administration, women's studies, and science, technology, and public policy. At least two courses must be research seminars requiring a substantive paper.

The following graduate courses pertain to Latin American studies.

| | |
|---|---|
| Anth 268 | Seminar: Peasant Society |
| Anth 272 | Seminar: Topics in Latin American Anthropology |
| Anth 282 | Seminar: Advanced Archaeology—New World Prehistory |
| Econ 251 | Economic Development Theories |
| Econ 252 | Economic Development Planning |
| Econ 281–82 | International Economics |
| Econ 285–86 | Economic Development of Latin America |
| Geog 223 | Seminar: The Population–Food Balance |
| Geog 250 | Seminar: Regional Development |
| Geog 261 | Seminar: Geography of Latin America |
| Hist 261 | Readings Seminar: Topics in 20th-Century Latin America |
| Hist 262 | Research Seminar: Agrarian Society and Economic Change in Modern Latin America |
| IAff 287 | Problems in Latin American Civilization |
| PSc 283 | Governments and Politics of Latin America |
| PSc 284 | International Relations of Latin America |

## LEGISLATIVE AFFAIRS—GRADUATE PROGRAM

Academic Director C.J. Deering

The Graduate School of Arts and Sciences offers a program leading to the degree of Master of Arts in the field of legislative affairs. This program focuses on the U.S. Congress with emphasis on the legislative process, American political institutions, and public policy analysis.

*Master of Arts in the field of legislative affairs*—Prerequisite: a bachelor's degree with a B average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The curriculum of 33 hours of course work includes the two courses from each of the four groups listed below. Each course carries 3 credit hours. The remaining courses are selected in consultation with the advisor. All students must pass a Master's Comprehensive Examination.

Group I—Legislative Processes

| | |
|---|---|
| PSc 218 | Legislative Politics |
| PSc 234 | Comparative Legislative Systems |

Group II—The Processes of Politics

| | |
|---|---|
| PSc 215 | Judicial Policy-making |
| PSc 216 | American Presidency |
| PSc 217 | Bureaucratic Politics |
| PSc 219 | American Political Parties and Elections |
| PSc 220 | Public Opinion and Political Socialization |
| PSc 221 | Interest-Group Politics |
| PSc 226 | Budgetary Politics |
| PSc 227 | Electoral Laws and Financial Practices |
| PSc 228 | Media and Politics |
| PSc 246 | U.S. Foreign Policy-Making |
| PSc 286 | Selected Topics in American Politics |

Group III—Public Policy Analysis

| | |
|---|---|
| PSc 212 | State and Urban Policy Problems |
| PSc 222 | Science, Technology, and Public Affairs |

PSc 224 *Domestic Policy Analysis—Selected Topics*
PSc 225 *Budgetary Policy*
PSc 249 *U.S. National Security Policy*
PSc 250 *Foreign Policy Analysis—Selected Topics*
WStu 240 *Women and Public Policy*

Group IV Legislative Research and Analysis
PSc 200 *Introduction to Political Analysis*
PSc 203 *Approaches to Public Policy Analysis*

## MANAGEMENT SCIENCE

Professors P.B. Vaill, J. Harvey, W.E. Halal, E.H. Forman, S.A. Umpleby, J.F. Lobuts, Jr., J.D. Frame
Professorial Lecturers Z.A. Shavell, A.S. Adams, G.T. Solomon, A.V. Harrell
Associate Professors E.K. Winslow (*Chair*), W.W. Hardgrave, J.P. Coyne, J.H. Carson, L. Graff, T.J. Nagy, W.G. Wells, Jr., P.W. Wirtz, W.J. Wenker, J. Liebowitz, J.M. Cary, R.G. Donnelly
Associate Professorial Lecturers C.A. Gruel, J.M. Montgomery
Assistant Professors Z. Karake (*Visiting*), R. Soyer

See the School of Government and Business Administration for programs of study leading to the degrees of Bachelor of Business Administration, Master of Business Administration, Master of Science in Information Systems Technology, and Doctor of Philosophy.

**First Group**

58 **Introduction to Information Processing** (3) Liebowitz
Basic principles, terminology, and methods of computer data processing. Introduction to the use of the computer as a tool through assignments illustrating typical problems encountered in business and government data processing. Assignments involve computer programming in a higher-level language. (Fall, spring, and summer)

**Second Group**

107 **Fundamentals of Behavioral Science** (3) Lobuts, Winslow
Survey of behavioral science research and practice as related to management. Emphasis on the basic human processes that contribute to the functioning of organizations. (Fall and spring)

119 **Computer Programming for Information Systems** (3) Coyne, Forman, Wirtz
COBOL programming for business and government data processing applications. For students already familiar with basic computer concepts and programming. Emphasis on practical computer applications in accounting and management information systems. Prerequisite: Mgt 58 or Stat 130. (Fall and spring)

120 **Information Systems Development I** (3) Carson, Coyne
Assessment of the systems concept and its relationship to organizational information decision making and management. Concepts and techniques involved in the initial development of new or revised computer-based information systems, e.g., systems analysis and design phases. Modern programming techniques are emphasized. Prerequisite: Mgt 58 and 119 or permission of instructor

121 **Information Systems Development II** (3) Coyne, Carson, Wirtz
A further examination of the information systems development process, including concepts and techniques for assessment, selection, introduction, operation, and maintenance of a newly designed automated information system. Prerequisite: Mgt 58 and 119 or permission of instructor.

122 **Special Studies in Information Systems** (3) Staff
An independent or group-study project in information systems development, which may involve faculty-supervised research, a case-study project, or field experience as an intern systems analyst in a local public or private organization. Prerequisite: Mgt 120 and 121 or permission of instructor. (Spring)

190 **Special Topics in Management Science** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated once for credit.

191 **Introduction to the Computer-Based Society** (3) Wirtz
Introduction to the role and function of computer technology in today's society. Topics include applications in office automation, business and finance, manufacturing, and education. Issue areas include changing employment patterns, computers and the individual, security and crime, and international competition. Computer software use includes word processing, spreadsheets, database management, and graphics applications packages. Open only to students who reside in Building JJ. (Fall)

192 **Our New Era: Technology and Society** (3) Wirtz
This is the second in the sequence for the residential program Technology and Society. In this course more advanced computer applications will be explored in the context of their relationship to societal issues, generated by the impact of technology. Students research and report on selected technology-related issues and future trends. Student groups pursue semester projects in selected computer applications areas. Open only to students who reside in Building JJ. (Spring)

199 **Individual Research** (3) Staff
Assigned topics. Admission by prior permission of advisor. May be repeated once for credit. (Fall, spring, and summer)

**Third Group**

201 **Management of Strategic Issues** (3) Halal, Lenn, Adams
The body of management theory and practice that has evolved recently to identify, analyze, and resolve strategic organizational issues. A survey of the methodology of the field; applications to critical issues in labor relations, energy and pollution, marketing and consumerism, business–government relations, and the global economy. Prerequisite: Mgt 205 or equivalent. (Spring and summer)

205 **Organization and Management** (3) Vaill, Hala
For designated students in the M.B.A. program. Integrative approach to organizational concepts, management principles, philosophy, and theory in public and private organizations. Evolution of management thought, functions, and practices, stressing present management approaches, general systems theory, and contingency management. (Fall, spring, and summer)

206 **Strategic Planning** (3) Halal
Formulation of strategies that enable organizations to adapt to changing social, technological, economic, and political conditions. Lectures, discussion, and exercises examine strategic planning practices and the environmental changes affecting corporations, government agencies, hospitals, and other major institutions. Students conduct a strategic planning project for an organization. (Fall)

210 **Individual and Group Dynamics in Organizations** (3) Harvey, Winslow, Vaill, Lobuts
For graduate students who wish to improve their skills in dealing with human behavior in organizations. The course is designed to improve theoretical and personal understanding of the roles of interpersonal and group dynamics in management. Focus on individual and group behavior in various organizational settings. Intensive work-group experience, focusing on theory, research, and group analysis. (Fall, spring, and summer)

211 **Current Issues in Organizational Behavior** (3) Winslow, Lobuts
Study of behavioral factors relating to issues such as automation, ethics, interpersonal relations, organizational change, and similar problems in organizational settings. Problems of conducting behavioral science research in organizations. (Fall)

212 **Behavioral Factors in the Process of Change** (3) Harvey, Winslow
Review of research, theory, and practice related to the process of human change. Students are provided the opportunity to apply their learning, using various media. This course emphasizes the relationship between theory and practice. (Fall, spring, and summer)

213 **Organization Development: A Management Function** (3) Lobuts, Harvey, Vaill
An exploration of the literature, culture, values, and skills that can assist a manager, leader, or administrator in carrying out the process of organizational development. Emphasis is on direct managerial intervention, although the role of consultants/facilitators in the process is explored. (Fall)

214 **Behavioral Factors in Management Consulting** (3) Harvey, Vaill, Lobuts, Winslow
Theories and methods of planning, introducing, and coping with change in management through the helping process. The dynamics of the consulting process includes phases of consultation, power dynamics, interpersonal relationships, and values. Intended both for managers seeking an understanding of the consultative approach to planned change and for persons in staff or consultative roles seeking such skills and understanding. (Spring)

215 **Conflict Management: Theory, Concepts, and Methods** (3) Lobuts, Harvey, Winslow
Exploration of various approaches to the causes of conflict and its resolution. Students study and experience ways to make conflict a creative rather than a destructive experience. Methods of conflict resolution are practiced. Conflict in the micro (person-to-person) and macro (system-to-system) levels are explored. Prerequisite: Mgt 210 or permission of instructor. (Fall and spring)

216 **Cross-Cultural Management** (3) Vaill
This course focuses on the variety of issues and opportunities that arise when managing outside one's own culture. The manager's credibility and effectiveness are assumed to be culture bound to some extent; outside of one's culture, one's actions may not mean what they do within one's culture. Emphasis on the personal level as opposed to the interinstitutional or intercultural levels. Extensive use of student experiences and research. (Summer)

218 **Computer Programming with Business Applications** (3) Forman, Graff, Liebowitz
For designated students in the M.B.A. program. Basic principles, terminology, and organization of computer systems. Emphasis on developing a proficiency in the use of higher-level programming language via computer solutions to production management and accounting problems. (Fall, spring, and summer)

220 **Quantitative Factors in Administration** (3) Forman, Graff, Hardgrave, Wirtz
Survey of quantitative techniques in solution of management problems. Potentials and limitations of mathematical models and proper areas for their application; use of the computer in solving such models. Topics selected from linear programming, probability, decision-making under uncertainty, queuing and inventory models, simulation, regression. Prerequisite: Mgt 218 and 270, or equivalent. (Fall and spring)

221 **Introduction to Probability Theory and Applications** (3) Hardgrave, Forman, Wirtz
Introduction to probability theory and its applications in management science and operations research; foundation course for further study of advanced probabilistic methods in operations research. Sample spaces,

conditional probability, common distributions, random variables, simple stochastic processes. Prerequisite: Math 42 or 52 or equivalent. (Alternate years)

222 **Mathematical Programming: Techniques and Applications** (3) Hardgrave, Forman, Graff
Technical and applied considerations of linear programming and related methods. Mathematical and computational aspects of linear programming. Formulation of linear programming models. Studies of applications of linear programming. Introduction to integer programming, algorithms, and formulations. Prerequisite: Math 42 or 52 or equivalent. (Alternate years)

223 **Techniques of Operations Research** (3) Hardgrave, Forman, Graff
Survey and introduction to contemporary operations research techniques, including nonlinear programming, dynamic programming, inventory and queuing models, and simulation. Applications of such methods as models of common processes. Prerequisite: Mgt 221, 222. (Alternate years)

224 **Executive Decision Support** (3) Forman
Concepts and methods for making complex decisions in both business and government: identifying criteria and alternatives, setting priorities, allocating resources, strategic planning, resolving conflict, and making group decisions. (Fall and spring)

226 **Decision Support Systems** (3) Forman, Graff, Hardgrave, Wirtz
Framework, processes, and technical components for building decision support systems dealing with unstructured and underspecified problems from managerial and organizational perspectives. Construction and exploration of decision support system models. Prerequisite: Mgt 220 or permission of instructor. (Spring)

229 **Modeling in Applied Operations Research** (3) Hardgrave
Advanced modeling exercises in applied operations research. Prerequisite: Mgt 223 or permission of instructor. (Alternate years)

230 **Management of Research and Development** (3) Wells, Donnelly
Examination of technological, political, and economic factors affecting the R&D environment; operational aspects; management problems in military, governmental, and industrial organizations; project selection, resource allocation, personnel, planning and control, measurement, and evaluation. (Fall and spring)

231 **Project Management** (3) Wells, Frame
Specialized aspects of project management, including development of requests for proposals; project selection, management, and costing; project politics; microcomputers in projects; and the role of the project manager. Project management skills applicable in a variety of organizational settings in which projects are used to accomplish operational objectives. Emphasis on applications. (Fall, spring, and summer)

232 **International Science and Technology** (3) Frame, Wells
Technology transfer among advanced countries and LDCs; national science and technology policies of various countries; international comparisons of scientific and technological capabilities; the technological basis for international trade and business, international licensing, patenting, and joint ventures; science and technology in economic development; international organizations; global transfer of military technologies; export controls of technology; major global issues concerning science and technology. (Fall, spring, and summer)

233 **Emerging Technologies** (3) Halal, Frame
Exploration of new developments in scientific and technological innovation, including automation, energy, medicine, bioengineering, social science, information technology, states of consciousness, and space. Emphasis on forecasting these technological advances and assessing their economic and social effects. An overarching theme is the role of advancing technology in driving social change. (Spring)

235 **Technological Entrepreneurship and Innovation** (3) Frame, Donnelly
An examination of the legal, organizational, personnel, financial, marketing, and production aspects of establishing and maintaining technology-based ventures. Special attention focuses on patent protection, trade secrets, licensing strategies, financial resources, tax implications, and venture management approaches. Case studies of recent high- and low-technology ventures. Preparation of a business plan is a major focus of the course. (Spring and summer)

239 **Seminar: Management of Research and Development** (3) Wells, Donnelly
Individual and or group in-depth research projects dealing with various phases of research and development management and their integration. Topic will vary each time the course is offered according to the emerging technology, current operational problems, and student interest. Prerequisite: 6 to 9 semester hours of research and development management or permission of instructor. (Fall)

240 **Survey of Information Technology** (3) Graff, Carson, Liebowitz, Wenker
Management-oriented survey of key areas in information technology, including hardware, software, systems development, management, and the computing milieu. Prerequisite: Mgt 218 or permission of instructor. (Fall, spring, and summer)

242 **Systems Analysis for Information Systems I** (3) Liebowitz, Wenker
Systems analysis for the development of a requirements specification for an information system. Topics include data gathering, information flow modeling, data item identification, data file organization, input-output requirements identification, and the identification of other requirements, such as reliability, response time, workload capability, environmental conditions, and training. Prerequisite: Mgt 240 (Fall and spring)

243 **Human Factors in Information Systems** (3) Nagy, Coyne, Cary
The user–system interaction that occurs with computerized information systems. The human factors of on-line dialogues, user psychology of computer systems, and various approaches to user–system interaction are considered. Examples of user–system interfaces from a variety of personal computer systems. Emphasis on the development of effective user–system interfaces. Prerequisite: Mgt 240. (Fall and spring)

244 **Telecommunications: Technology, Applications, and Operations** (3) Cary
Basic technical concepts, applications, and trends of telecommunications; operations; cost considerations of implementing telecommunications systems. Prerequisite: Mgt 240.

245 **Database Management for Information Systems** (3) Coyne, Cary
Introduction to the theory, architecture, and implementation of database management systems in corporate and organization information systems. Emphasis on fundamental concepts of database management and processing; broad understanding of designing data bases for business applications and implementing such data bases using commercially available packages; current trends in database systems. Prerequisite: Mgt 240 or permission of instructor. (Fall and spring)

249 **Seminar: Information Technology** (3) Graff, Wenker
Current trends in the design and implementation of computer-supported systems, emphasis on current state of the art through discussion with leading experts in the field and analysis of literature. Prerequisite: Mgt 240, 242, 243; or permission of instructor. (Fall and spring)

253 **Security and Privacy of Information Systems** (3) Wenker, Cary
An advanced course in information technology, emphasizing the philosophies, principles, and practices of security management in and impact of privacy legislation on computer-based systems. Risk assessment, state-of-the-art measures, trends in the information security field, and roles of the various levels of management and technological staff. Prerequisite: Mgt 218 or 240.

255 **Applied Expert Systems** (3) Nagy
Expert systems are interactive computer programs that can perform as well as experts in some specialized area, explain their reasoning and conclusions, tolerate incomplete and imprecise descriptions, and perform non-numeric computations. Students obtain hands-on experience in using expert system technology by building a Business Expert System. Prerequisite: Mgt 240 or permission of the instructor.

261 **Introduction to Systems Theory and Cybernetics** (3) Umpleby
Systems theory and cybernetics involve efforts to formulate principles that govern information processing and decision-making activities, whether these occur in human beings, machines, or social organizations. The course covers ways of conceptualizing systems, strategies for regulating systems, and paradoxes involved in self-regulation. (Fall)

262 **Methods for Making Organizations Adaptive** (3) Umpleby
An adaptive organization must solve day-to-day problems and periodically restructure itself to meet new challenges and opportunities. The course reviews several strategies for conducting a planning process and models of organizational design to stimulate creative thinking about structures and processes that can lead to a new plan for an organization. (Spring)

264 **System Dynamics Modeling** (3) Umpleby, Ericson
Computer modeling of organizational problems using system dynamics and the dynamo programming language. Review of previous applications of system dynamics and comparison of system dynamics with other modeling approaches. Causal influence diagrams, level and rate diagrams, equations, testing, and analysis. In conjunction with people in an organization, students develop a system dynamics model of some aspect of the organization. (Fall)

265 **Artificial Intelligence and Cybernetics** (3) Umpleby
Artificial intelligence is one approach to building computers that simulate human behavior. Cybernetics provides a theory of information processing and cognition that can be used both in the design of software and the interpretation of implications of new computer technology for individuals and organizations. The course reviews the theoretical and philosophical literature on the prospects for automating intelligent behavior. (Spring)

270 **Mathematics and Statistics for Management** (3) Hahn, Forman, Graff, Hardgrave, Wirtz
For designated students in the M.B.A. program. Mathematical and statistical concepts employed in the solution of managerial problems. Applications of functions, elements of calculus and linear algebra. Introduction to probability, frequency distributions, statistical inference, and regression and correlation. (Fall, spring, and summer)

274 **Modeling and Analysis for Business Decisions** (3) Wirtz
Modern business modeling and analysis methods used to solve business problems, with advanced applications from many fields of business. Emphasis on the integrated use of business methods, quantitative methods, and computers to reduce the risk associated with the management of a modern business entity. Prerequisite: Econ 217–18; Acct 201; Mgt 205, 218, 270; BAd 201, 220, 240; or equivalent with permission of instructor. Same as BAd 294. (Fall and spring)

275 **Managerial Statistics I** (3) Forman, Hardgrave, Wirtz
Statistical methods and their applicability to management. Topics include sampling, estimation, hypothesis testing, regression and analysis of variance. Use of computer software packages in applying the statistical techniques. Prerequisite: Mgt 218 and 270 or equivalent. (Fall and spring)

276 **Managerial Statistics II** (3) Forman, Hardgrave, Wirtz
Statistical modeling of management applications. Topics selected from multiple regression, analysis of variance, analysis of covariance, forecasting techniques, analysis, and other multivariate methods. Use of computer software packages for statistical modeling. Prerequisite: Mgt 275 or permission of instructor. (Spring)

280 **Information Systems Development and Application** (3) Cary
An advanced course in information technology, emphasizing philosophies, principles, and practices common to the development and application of information systems. Classical and structured systems development. Alternative automated development approaches, including prototyping using Fourth Generation Languages and Computer-Aided Software Engineering methodologies, with emphasis on systems analysis. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. (Fall and spring)

282 **Information Systems and Telecommunications** (3) Cary, Carson, Forman
Principles of telecommunications; applications of telecommunications for the transmission of data communications to enhance the flow of information within an organization. Identifying opportunities for applying technology in ways that will support the efforts of an organization. Terminology, hardware and software considerations, and the Open System Interconnection model-based communication. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. (Fall, spring, and summer)

283 **Topics in Higher-Level Languages** (3) Carson, Nagy, Wirtz
The emerging high-level languages used for the development of information systems. The very-high-level languages, such as PROLOG, MUMPS, and APL, are addressed along with systems languages, such as C, Modula 2, and Ada. The syntax, semantics, and applicability of the languages are discussed in detail. Not all languages are offered every semester; programming assignments are made in the languages studied. May be repeated once with approval of instructor. Prerequisite: Mgt 120 and 280. (Fall and spring)

284 **Database Systems** (3) Coyne, Cary
An in-depth approach to the understanding and use of the latest techniques for developing and implementing an effective database system. Topics include database organization, creation, and maintenance; evaluation criteria; standardization of database systems; and analysis of the state of the art in database development. Prerequisite: M.S. in I.S.T. degree candidacy; Mgt 280 or permission of instructor. (Fall and spring)

285 **Workshop in Database and Expert Systems** (3) Coyne, Forman
Analysis and solution of complex information problems through commercially available database and expert systems; development of evaluation methodology, comparison of implementation strategies. Hands-on experience with major commercial systems. Prerequisite: M.S. in I.S.T. degree candidacy, Mgt 284 or permission of instructor. (Fall and spring)

286 **Operating Systems** (3) Carson
Principles of operating systems; role of the operating system in resource allocation activities inherent in large-scale digital computers. The specialized functions of these systems are defined, and logical requirements of each are specified, including data structuring, multiprogramming, I/O spooling, and job control. Commercial operating systems studied as examples. Prerequisite: M.S. in I.S.T. degree candidacy. (Fall)

287 **Design of On-Line Information Systems** (3) Carson
Introduction to the analysis, design, and implementation of on-line business information systems. Topics include requirements analysis, functional specifications, file design, man–machine dialogue design, response time requirements, user psychology. Prerequisite: M.S. in I.S.T. degree candidacy; Mgt 284 or permission of instructor. (Spring)

288 **Applied Artificial Intelligence Programming** (3) Nagy, Wirtz, Liebowitz
Experience in exploiting new methods of developing both traditional and artificial intelligence computer applications based on programming methods originating in artificial intelligence research. The focus of the course is rule-based programming and the object programming paradigm. Students use either of these techniques to build a traditional system or an artificial intelligence system. Prerequisite: M.S. in I.S.T. degree candidacy or permission of instructor. (Spring)

290 **Special Topics in Management Science** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated once for credit.

298 **Directed Readings and Research in Management Science** (3) Staff
(Fall and spring)

299 **Thesis Seminar** (3) Staff
(Fall and spring)

300 **Thesis Research** (3)
(Fall and spring)

**Fourth Group**

Fourth-group courses are primarily for doctoral students. They are offered as the demand requires. They are open to selected master's students upon petition approved by the Associate Dean. Staff

311–12 **Seminar: Public–Private Sector Institutions and Relationships** (3–3)
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society. Prerequisite: doctoral degree candidate status. (Academic year) Hardgrave

328 **Seminar: Operations Research** (3)
Special topics and advanced applications in operations research, such as catastrophe theory, Markovian decision processes, or applications of the calculus of variation in economics and finance. May be repeated once for credit. Prerequisite: Mgt 223 or permission of instructor. Umpleby

365 **Seminar in Cybernetics and General Systems Theory** (3)
A review of recent literature in the field; guiding questions that have led to the development of general systems theory and cybernetics; comparison of these theories with other approaches to understanding organizations and management. Prerequisite: Mgt 262, 266. (Spring) Vall

390 **Philosophical Foundations of Administrative Research** (3)
Philosophy of science as applied to research in administration. Topics include the nature and current problems of epistemology, the development and role of theories, and the relationship between theory, methodology, and empirical data. (Fall and spring) Wirtz, Newcomer, Harrell

391 **Methodological Foundations of Administrative Research** (3)
Examination of the process of social science research. Use of models and theoretical frameworks in research; formulation of research questions, hypotheses, operational definitions, research design, sampling methods, and data analysis approaches. Primary emphasis on the development of dissertation proposals. (Fall and spring) Staff

398 **Advanced Reading and Research** (arr.)
Limited to doctoral candidates preparing for the general examination. May be repeated for credit. (Fall and spring) Staff

399 **Dissertation Research** (arr.)
Limited to doctoral candidates. May be repeated for credit.

## MATHEMATICS

*Professors* T.P.G. Liverman, H. Kenyon, R.L.A. Bari, I. Katz, H.D. Junghenn *(Chair)*
*Adjunct Professor* J. Eftis
*Professorial Lecturers* Y. Akiyama, B.R. McDonald
*Associate Professors* I.I. Glick, M.P. Lee, E.A. Stone, M.M. Gupta,
*Assistant Professors* F.E. Baginski, D.H. Ullman, V. Harizanov, E.A. Robinson, R. Simion
*Assistant Professorial Lecturer* P. Echeverria
*Instructor* N. Taghavi

*Bachelor of Arts or Bachelor of Science with a major in mathematics (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math 31, may be waived upon examination before registration.)
3. Required courses in the major—a minimum of 24 semester hours of second-group courses in mathematics, including Math 106, 121, 123, 139, and 140. It is also strongly recommended that students take French, German, or Russian, and mathematically related courses in such subjects as physics, statistics, economics, and engineering.
4. Undergraduates who want honors status should contact a department advisor for a specific program. Such status may be requested as early as completion of Math 32.

*Bachelor of Arts or Bachelor of Science with a major in applied mathematics (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math 31, may be waived upon examination before registration.)
3. Required courses in related areas:
   (a) Stat 189–90.
   (b) Eighteen semester hours to be selected, in consultation with the department advisor, from economics, statistics, engineering and physical sciences, or computer science. At least 12 semester hours must be chosen from one area, and at least 12 semester hours must be chosen from courses numbered 101 or higher. For courses in applied science, civil engineering, electrical engineering, computer science, engineering administration, mechanical engineering, and operations research, see the *School of Engineering and Applied Science Bulletin*.
4. Required courses in the major—a minimum of 24 semester hours of second-group courses in mathematics, including Math 111, 112, 124, 139, 140, and at least two courses from Math 180, 181–82. It is also strongly recommended that students take French, German, or Russian.
5. Undergraduates who want honors status should contact a department advisor for a specific program. Such status may be requested as early as completion of Math 32.

*Minor in mathematics*—Requirements: a minimum of 18 semester hours in mathematics courses, of which at least 9 hours must be at the 100 level or higher, chosen in consultation with a departmental advisor.

*Master of Arts in the field of mathematics*—Prerequisite: a bachelor's degree with a major in mathematics from this University, or an equivalent degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Students must complete 30 semester hours of approved course work, with or without a thesis, and must pass a comprehensive examination.

*Master of Arts or Master of Science in the field of applied mathematics*—Prerequisite: a bachelor's degree with a major in mathematics or a related field such as statistics, a physical science, engineering, or economics.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Course work is divided between mathematics courses and courses from one area of application—economics, engineering (civil, electrical, or mechanical engineering; operations research; or engineering administration), physics, statistics, or urban and regional planning. Courses in the chosen area of application are selected in consultation with the relevant department.

Candidates for the degree of Master of Arts must complete 30 semester hours of approved course work, which may include Math 299–300 *Thesis Research*, and must pass a comprehensive examination. At least 15 semester hours must be in mathematics courses, with no more than 6 hours of these from second-group courses. The remaining courses are chosen from the selected area of application. Theses are jointly supervised by the Department of Mathematics and the department concerned with the area of application. There is no thesis requirement.

Candidates for the degree of Master of Science must complete 30 semester hours of course work and must pass a comprehensive examination. At least 15 semester hours

must be in mathematics courses, with no more than 6 semester hours from second-group courses. There is no thesis requirement.

*Master of Science for Teachers*—Prerequisite: A bachelor's degree; at least 12 semester hours or equivalent in mathematics courses, including the equivalent of Math 31; experience in teaching mathematics at the secondary school level.

Required: 30 semester hours of approved second- or third-group mathematics courses, including Math 168.

*Doctor of Philosophy in the field of mathematics*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The department doctoral program committee, after consultation with the student, will stipulate (1) courses that must be taken to fulfill the 48-semester-hour requirement leading to the General Examination; (2) the two languages, selected from French, German, or Russian, to satisfy the foreign language requirement; and (3) the four areas of study in which the student must prepare for the General Examination. The doctoral program committee will appoint a Director of Research when the student has selected (preferably early in the program) one of the following research fields for the dissertation: functional analysis (abstract differential equations, generalized functions, groups of operators), group representations, linear algebra (matrix theory), logic, measure and integration, numerical analysis, ordinary and partial differential equations, combinatorics, graph theory, ergodic theory, semigroups, and topology (general topology, analytic topology, topological groups).

**First Group**

3 **College Algebra** (3) Gupta and Staff
Equivalent to the standard two years of high school algebra with several additional topics. Prerequisite: one year each of high school algebra and high school geometry. (Fall and spring)

6 **Plane Trigonometry** (3) Gupta and Staff
Prerequisite: two years of high school algebra and one year of high school geometry, or Math 3. (Fall and spring)

9 **General Mathematics I** (3) Katz and Staff
Logic, sets, foundations of the number system, abstract mathematical systems, groups. (Fall and spring)

10 **General Mathematics II** (3) Katz and Staff
Algebra, Euclidean and non-Euclidean geometries, probability and statistics, matrices. (Fall and spring)

12 **General Mathematics with Computers I** (3) Liverman
Sets; logic; vectors and matrices. Functions and graphing instruction is accompanied by microcomputer practice, using the APL programming language. Primarily for nonscience majors. No computer experience needed. (Fall)

13 **General Mathematics with Computers II** (3) Liverman
Introduction to the basic concepts of calculus. Elements of probability theory and statistics. Elements of trigonometry. Topics are presented with microcomputer accompaniment, using the APL programming language. Primarily for nonscience majors. Prerequisite: Math 12. (Spring)

30 **Precalculus** (3) Bari and Staff
Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry, and one-half year of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry. (Fall and spring)

31 **Single-Variable Calculus I** (3) Kenyon and Staff
Differentiation and integration of algebraic functions, exponentials and logarithms with simple applications. Arc length. Conic sections. Prerequisite: Math 30 or equivalent. (Fall and spring)

32 **Single-Variable Calculus II** (3) Kenyon and Staff
Calculus of trigonometric and hyperbolic functions. Techniques of integration. Taylor formula. L'Hopital's rules. Infinite series; polar coordinates; 3-dimensional vectors. Prerequisite: Math 31. (Fall and spring)

33 **Multivariable Calculus** (3) Kenyon and Staff
Vector-valued functions. Partial differentiation. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32. (Fall and spring)

37 **Computer Programming with Calculus** (3) Gupta
Computer programming in conjunction with calculus, leading to a better appreciation of basic concepts, especially infinity and infinitesimals. Fundamentals of FORTRAN or BASIC, limits of functions and quotients, derivatives as limits of quotients. Increments and differentials (e.g., volumes as functions of radii); rates of change, indeterminate forms; definite integrals; trapezoidal rule; areas and volumes.

41 **Calculus for Economists I** (4) Junghenn
Differentiation and integration of algebraic and elementary transcendental functions; marginal analysis for functions of one variable; optimization of functions of one variable applied to economics. Prerequisite: Math 30 or equivalent. (Fall)

42 **Calculus for Economists II** (4) Junghenn
Elementary linear algebra with economics applications, including input–output models; partial derivatives; multiple integrals; marginal analysis for functions of several variables; optimization of functions of several variables applied to economics; infinite series. Prerequisite: Math 41. (Spring)

*51 **Mathematics for the Social and Management Sciences I** (3) Glick and Staff
Solution of systems of linear equations; notion of function, graph of function; sequences; differential calculus of functions of one variable, exponential and logarithmic functions. New students must take a placement examination in algebra prior to registration. (Fall and spring)

*52 **Mathematics for the Social and Management Sciences II** (3) Glick and Staff
Integral calculus of functions of one variable; functions of several variables; partial derivatives, maxima and minima, Lagrange multipliers; matrix algebra, linear programming; difference equations and mathematics of finance. Prerequisite: Math 51. (Fall and spring)

**Second Group**

101 **Introduction to Mathematical Logic** (3) Harizanov
Introduction to proof theory and model theory of propositional and predicate calculi, computability, topics from foundations of mathematics. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Fall, even years)

102 **Axiomatic Set Theory** (3) Harizanov
Zermelo–Fraenkel set theory, ordinals and cardinals, foundations of the real number system. Prerequisite: Math 101 or permission of instructor. (Spring, odd years, when demand warrants)

103 **Computability** (3) Harizanov
Introduction to recursive functions. Various equivalent concepts of computability, numbering computable functions, diagonal method, S-M-N theorem, universal functions, undecidable problems, Church's thesis, recursive enumerability, reducibility and degrees, fixed-point theorems, complexity of computation. Prerequisite: Math 32 or permission of instructor.

104 **Mathematics and Human Thought** (3) Staff
Philosophical and historical aspects of mathematics and its interplay with

* Social and management science students with a strong record in high school mathematics are advised to take Math 31, 32, and 124 instead of Math 51 and 52. Economics students are advised to take Math 41 and 42.

other disciplines from antiquity to modern times. Prerequisite: two years of high school mathematics. (Offered when demand warrants)

105 **Problem Solving and Mathematical Proofs** (3) Ullman
Types of reasoning encountered in mathematics. Techniques of mathematical problem solving, writing, and proofs. Logical structure of mathematical proofs. Mathematical induction. Prerequisite: Math 32. (Spring)

106 **Introduction to Topology** (3) Stone and Staff
Prerequisite: Math 139 or permission of instructor. (Fall)

107 **Introduction to Algebraic Topology** (3) Staff
Prerequisite: Math 122 and 139, or permission of instructor. (Fall, even years, when demand warrants)

111 **Mathematics for Engineers and Physicists I** (3) Stone
Differential equations. Laplace transform. Series solutions of differential equations. Boundary value problems. Prerequisite: Math 33. (Fall)

112 **Mathematics for Engineers and Physicists II** (3) Stone
Vector analysis. First- and second-order partial differential equations. Topics in complex variables. Prerequisite: Math 111. (Spring)

113 **Graph Theory** (3) Simion
Directed and undirected graphs; bridges, cutpoints, and blocks; connectivity; partitions; Eulerian and Hamiltonian graphs; planarity; coloring problems. Flow charts for computer applications. Prerequisite: Math 32. (Fall and spring)

121–22 **Introduction to Abstract Algebra** (3–3) Lee
Selected topics in elementary number theory, groups, rings (including polynomial rings), and fields. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Academic year)

123 **Linear Algebra** (3) Katz
Theory of vector spaces, linear transformations, and matrices. Quadratic and bilinear forms, spectral decomposition. (Fall)

124 **Introduction to Matrix Theory** (3) Liverman and Staff
Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors. Hamilton–Cayley theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or 42 or permission of instructor. (Fall and spring)

125 **Linear Programming** (3) Katz
Simplex algorithm, degeneracy, the assignment problem, duality theorem, post-optimality, the transportation problem, integer programming, applications. Prerequisite: Math 123 or 124, or equivalent. (Offered when demand warrants)

132 **Introduction to Discrete Structures** (3) Staff
Joint offering of the Statistics and Mathematics Departments. Discrete structures and associated mathematical tools. Topics include sets, functions, relations, directed and undirected graphs, propositional calculus, Boolean algebras, with applications to computer science. Prerequisite: Stat 130 or Math 31. (Fall)

134 **Introduction to Boundary-Value Problems** (3) Gupta and Staff
Prerequisite: Math 111 or 142. (Offered when demand warrants)

135 **Projective Geometry** (3) Staff
Prerequisite: Math 123 or 124, or equivalent. (Offered when demand warrants)

139 **Advanced Calculus I** (3) Junghenn and Staff
Topology of $R^n$. Continuous mappings. Uniform convergence. Differentiable mappings. Prerequisite: Math 33. (Fall)

140 **Advanced Calculus II** (3) Junghenn and Staff
Contraction maps, implicit function and differential equation theorems. Integration theory. Differential forms. Stokes's theorem. Prerequisite: Math 139 or equivalent. (Spring)

141 **Differential Geometry** (3) Baginski
Curves in space; local theory of surfaces, including the fundamental equations of surface theory, the *theorema egregium* of Gauss, geodesics; global theory of surfaces, including the Gauss–Bonnet theorem, surfaces of constant Gauss curvature. Prerequisite: Math 140; Math 123, 124, or equivalent. (Fall)

142 **Introduction to Differential Equations** (3) Glick and Staff
Linear and some nonlinear differential equations. Topics include existence theorems, stability, control theory, limit cycles, and applications to physics and ecology. Prerequisite: Math 139 and 123 or 124, or permission of instructor. (Spring)

153 **Introduction to Numerical Analysis I** (3) Gupta and Staff
Accuracy and precision. Linear systems and matrices. Direct and iterative methods for solution of linear equations Sparse matrices. Solution of nonlinear equations. Interpolation and approximate representation of functions, splines. Prerequisite: Math 33 or equivalent and some knowledge of computer programming. (Fall, even years)

154 **Introduction to Numerical Analysis II** (3) Gupta and Staff
Numerical differentiation and integration. Solution of ordinary differential equations. Introduction to optimization theory, gradient techniques. Least squares and applications, data fitting. Prerequisite: Math 153 or permission of instructor. (Spring, odd years)

157 **Introduction to Complex Variable Theory** (3) Liverman and Staff
Analytic functions. Power series. Contour integration and calculus of residues. Conformal mapping. Physical applications. Prerequisite: Math 139. (Spring)

168 **Seminar: Curriculum Studies (3)** Staff
Open only to candidates for the degree of Master of Science for Teachers, teachers for in-service training or students recommended by the department of education. Critical examination of secondary school mathematics, curricula, techniques and programs. Prerequisite. Math 31 and permission of instructor. (Offered when demand warrants)

180 **Computer Mathematics and Modeling** (3) Liverman
Introduction to the APL programming language in the context of applications to numerical methods in mathematics and the sciences. Construction of mathematical models of physical and other systems. Individual or team projects using the microcomputer. Prerequisite: Math 32; Math 124 or permission of instructor. (Fall)

181–82 **Seminar: Applied Mathematics** (3–3) Glick and Staff
Prerequisite: Math 140, Stat 189–90, some knowledge of linear algebra, senior status as major in Applied Mathematics. (Academic year)

191 **Special Topics** (arr.) Staff
Admission by permission of instructor. May be repeated for credit. Offered upon demand.

195 **Reading and Research** (arr.) Staff
Under the personal direction of an instructor. Limited to mathematics and applied mathematics majors with demonstrated capability Prior approval of instructor required. May be repeated for credit. (Fall and spring)

**Third Group**

Courses marked with an asterisk are offered every year. Courses listed by title alone are offered when, and with such contents, as demand warrants.

ALGEBRA

201–2 **Modern Algebra I and II** (3–3) Katz
Fundamental concepts of groups, rings, and fields. (Academic year)

203 **Modern Algebra III** (3) Katz
(Fall, odd years)

204 **Representation Theory** (3) Fee
Representations of finite groups, including symmetric group, group characters, and induced representations. Prerequisite: Math 202. (Fall)

205 **Matrix Theory** (3) Katz
Topics to be chosen from generalized inverses of matrices and their applications to solutions of equations and to LP problems; positive definite matrices and their applications; Riemann matrices; linear groups; quadratic forms and Hilbert's eleventh problem; numerical range of linear operators. (Spring, even years) Staff

206 **Topics in Algebra** (3)

## ANALYSIS AND APPLIED MATHEMATICS

*211 **Complex Analysis I** (3) Glick and Staff
Topology of complex numbers; elementary functions; integrals; Cauchy's theorem; maximum modulus and Liouville theorem; Taylor and Laurent series; classification of singularities; contour integration; the residue theorem; continuation, multivalued functions, and branch points. Prerequisite: advanced calculus. (Spring)

212 **Complex Analysis II** (3) Glick and Staff
Harmonic functions, partial fractions, Mittag-Leffler theorem; entire functions, the Hadamard product theorem, the gamma function; Hurwitz's theorem, normal families of functions. The Riemann mapping theorem, analytic continuation, Riemann surfaces. Prerequisite: Math 211 or equivalent (Spring, even years, when demand warrants)

213 **Applications of Complex Analysis** (3) Liverman and Staff
Topics chosen from potential theory and conformal mapping, special functions, asymptotic expansions; steepest descent, stationary phase, and WKB methods. Fourier and Laplace transforms, Wiener–Hopf method, dual and singular integral equations. Prerequisite: Math 211 or an undergraduate course in complex variables. (Spring, odd years, when demand warrants)

*214 **Measure and Integration Theory** (3) Ullman and Staff
Lebesgue measure and integration in abstract spaces. Probability measures. Absolute continuity; Radon–Nikodym theorem; measure on product spaces. Fubini theorem. $L^p$ spaces. Prerequisite: advanced calculus (Fall)

*215 **Introduction to Functional Analysis** (3) Robinson and Staff
Topological and metric spaces; Tychonoff theorem; completion of a metric space; normed and Banach spaces; linear functionals and operators. Hahn-Banach theorem; principle of uniform boundedness; the closed-graph theorem and interior mapping principle; Hilbert spaces; eigenvalues, eigenvectors, invariant subspaces, and projection operators; operational calculus; functions defined on the spectrum. Prerequisite: advanced calculus (Fa

216 **Banach Algebras and Spectral Theory of Operators** (3) Robinson
Gelfand theory of commutative Banach algebras; function algebras, Stone-Cech compactification, application to the spectral theory of operators, spectral theorem for bounded and unbounded operators. Prerequisite: knowledge of measure and integration, introduction to functional analysis, and Tychonoff and Stone–Weierstrass theorem. (Spring, odd years, when demand warrants)

217 **Introduction to Ordinary Differential Equations** (3) Glick
First course in ordinary differential equations; existence and uniqueness of solutions; continuity of solutions with respect to initial conditions, properties of linear systems. Prerequisite: advanced calculus. (Spring) Staff

218 **Topics in Ordinary Differential Equations** (3) Liverman

219 **Partial Differential Equations** (3)
Classical and modern techniques for the exact and approximate solution of PDEs. Separation of variables, Green's functions, variational methods, Hilbert space methods. Prerequisite: advanced calculus. (Spring) Liverman

220 **Topics in Partial Differential Equations** (3)

221 **Calculus of Variations** (3)

222 **Introduction to Numerical Analysis** (3) Glick Gupta
Computer arithmetic and round-off errors. Solution of linear systems and nonlinear equations. Interpolation and approximations. Numerical differentiation and integration. Eigenvalues and eigenvectors. Prerequisite: knowledge of advanced calculus and computer programming. (Fall)

223 **Numerical Solution of Ordinary and Partial Differential Equations** (3) Gupta and Staff
Initial and boundary value problems for ordinary differential equations. Error propagation, convergence and stability. Finite difference and finite element methods for partial differential equations. Prerequisite: knowledge of differential equations and computer programming. (Spring)

224 **Generalized Functions and Operational Methods** (3) Liverman

225 **Theory of Generalized Functions and Distributions** (3) Liverman

226 **Control Theory** (3) Glick

227–28 **Introduction to System Theory** (3–3) Staff

229 **Mathematical Programming** (3) Katz

230 **Topics in Analysis** (3) Staff

231 **Topics in Applied Mathematics** (3) Staff

232 **Topics in Numerical Analysis** (3) Gupta and Staff
Numerical methods and software. For science and engineering students. Introduction to the methods, tools, and ideas of numerical computation. Emphasis on problem solving using standard mathematical software, such as IMSL subroutines and Math Protran. Interpolation, linear, nonlinear, and differential equations. Prerequisite: matrix theory, differential equations, and FORTRAN programming. (Spring)

241–42 **Mathematical Foundations of Stochastic Processes** (3–3) Junghenn
A mathematically rigorous study of conditional probability and expectation, martingales, stopping times, Brownian motion, and Markov processes. Prerequisite: Math 214 or the equivalent.

COMBINATORIAL MATHEMATICS

261 **Combinatorics** (3) Simion
Generating functions, recurrence relations, counting theorems. Selected topics. Applications to statistical mechanics, information theory, design of experiments, operations research, linear and dynamic programming, network theory. Prerequisite: undergraduate modern algebra and linear algebra. (Spring)

262 **Graph Theory** (3) Simion
Electrical and other networks, matroids, chemical isomers, crystal structure, linear programming, operations research, Markov chains, Feynman diagrams, selected topics in graph theory from introductory topics to problems currently of research interest. (Spring, even years)

263 **Topics in Combinatorial Mathematics** (3) Staff

LOGIC

271 **Introduction to Mathematical Logic** (3) Harizanov
Propositional and predicate calculus (first order): syntax, formation rules, semantics, axioms, proof and deduction, object vs. metalanguage, deduction theorem, compactness theorem, Gödel–Henkin completeness theorem, Craig's interpolation theorem, Beth's definability theorem. First-order recursive arithmetic, incompleteness and undecidability. (Fall, odd years)

272 **Topics in Logic** (3) Harizanov

TOPOLOGY

281–82 **General Topology** (3–3) Kenyon and Staff
General topological spaces, separation axioms, compactness, and connectedness. Metrization, uniform spaces, and complete spaces. (Math 281—fall)

283–84 **Topological Groups** (3–3) Junghenn
285 **Topological Vector Spaces** (3) Junghenn
287 **Differentiable Manifolds I** (3) Glick
Differentiable manifolds, tangent vectors, submanifolds, imbeddings and immersions, vector fields and differential equations on manifolds, tensors and differential forms, Lie derivatives, orientability. (Fall, even years)
288 **Differentiable Manifolds II** (3) Glick
Manifolds with boundary, integration on manifolds, Stokes's theorem and the divergence theorem, the Brouwer fixed-point theorem, deRham groups, Riemannian manifolds, geodesics, curvature. (Spring, odd years, when demand warrants) Staff
289 **Topics in Topology** (3)
May be repeated for credit.

RESEARCH Staff

295 **Reading and Research** (3)
May be repeated for credit.

**Fourth Group** Staff

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. Staff
399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit.

## MICROBIOLOGY—GRADUATE PROGRAMS

*Professors* R. Hugh, L.F. Affronti (*Chair*), M. Reich, P.D. Kind, J.W. Albright
*Associate Professor* G.V. Stokes

*Master of Science in the field of microbiology*—Prerequisite: a bachelor's degree with a major in biological or physical sciences from this University, or an equivalent degree. The undergraduate program must have included the following courses or equivalent: BiSc 11–12; Chem 11–12, 151–52, 153–54; Math 30, 31 (31 may be taken concurrently with the graduate program); Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences. A total of 30 semester hours is required, 24 hours of course work and 6 hours of thesis (Micr 299–300). The course work must include Bioc 221–22 and Micr 277–78. The remaining academic work should consist of graduate-level courses selected with the approval of the department.

*Master of Science in the field of clinical microbiology (supervisory track)*—A program offered jointly by the Microbiology and Pathology Departments. Prerequisite: a bachelor's degree in medical technology or in biological or physical science and a minimum of three years of experience, within the last five years, in a clinical laboratory.

Required: the general requirements stated under the Graduate School of Arts and Sciences. This is a nonthesis program requiring a total of 36 semester hours, including Bioc 221–22; Micr 225–226; Path 230, 231, 232; Micr or Path 294; and Stat 12. The remaining academic work should consist of graduate-level courses selected with the approval of the Microbiology and Pathology Departments.

*Doctor of Philosophy in the field of microbiology*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The General Examination covers at least four fields, two of which must be in microbiological disciplines.

*Research fields*: immunology, pathogenic microbiology (including subdisciplines: bacteriology, parasitology, and mycology), and molecular and cellular biology (including virology, microbial physiology, and genetics).

211 **Microbiology** (3)
Survey of bacteria, viruses, rickettsiae, fungi, parasites, and immunology

concepts. Prerequisite or concurrent registration: Bioc 221–22, or other biochemistry course, and permission of instructor. (Fall)

212 **Pathogenic Bacteriology** (3) Hugh
Principles of pathogenic bacteriology. Isolation and identification of bacterial agents that cause diseases in humans. Pathogenic characteristics of bacteria. Prevention and control of bacterial diseases in humans. Prerequisite: BiSc 111 or equivalent; Bioc 221–22. Laboratory fee, $20. (Spring)

213 **Bacterial Pathogenesis** (3) Hugh
Development of bacterial diseases in humans. Prerequisite: Micr 212 or equivalent. (Fall)

214 **Tissue Cell Culture** (3) Albright, Bradlaw*
Fundamental aspects of tissue culture, with emphasis on mammalian cells. Specialized techniques and applications of cell culture procedures, emphasizing quality control practices. Prerequisite: Bioc 221–22. (Spring)

215 **Parasitology** (2) Turner†
Study of host–parasite relationships. Clinical recognition of important parasites in medicine. (Fall)

219 **Scientific Writing** (1) Hugh
A basis for preparing theses, dissertations, and publications. (Fall)

225 **Microbial Physiology I** (3) Reich, De Giovanni-Donnelly‡
Microbial structure, nutrition, transport, growth, genetics, metabolism, and regulatory mechanisms. Prerequisite: Bioc 221–22 (Fall)

226 **Microbial Physiology II** (3) Reich, De Giovanni-Donnelly
The actions of antimicrobial agents and antibiotics on the structure and biochemistry of microorganisms at the cellular and molecular level. Prerequisite: Micr 225 or permission of instructor. (Spring)

227 **Microbial Physiology Laboratory** (2) Reich
The application of laboratory techniques and instrumentation to topics covered in Micr 225 and 226. Prerequisite: Micr 226. Laboratory fee, $20. (Fall)

229 **Immunology** (3) Kind, Affronti
Lecture course. Fundamental immunologic concepts. Antigens, antibodies, antigen and antibody reactions *in vitro* and *in vivo*, and the immune response. Prerequisite: Bioc 221–22. (Fall)

230 **Immunology Laboratory** (2) Kind, Affronti
Emphasis on methods in serology, immunochemistry, and cellular immunology that are used in research laboratories. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Limited to students enrolled in the microbiology graduate program. Laboratory fee, $20. (Fall, odd years)

231 **Immunobiology** (1) Affronti, Kind
Study of immunological functions of reticulo-endothelial tissues, theories of autoimmunity, graft rejection, tumor immunity, delayed hypersensitivities, and immunogenetics. Clinical faculty discuss relevant aspects of immunobiology. For medical students; open to graduate students. Prerequisite: Micr 201§ or 229, and permission of instructor. (Fall)

233 **Virology** (3) Stokes
Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Bioc 221–22 or permission of instructor. (Fall)

234 **Virology Laboratory** (2) Stokes
Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee, $20. (Fall)

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* June Adeline Bradlaw is Adjunct Associate Professor of Microbiology in the G.W.U. School of Medicine and Health Sciences.
† Virginia M. Turner is Adjunct Assistant Professor of Parasitology in Microbiology in the G.W.U. School of Medicine and Health Sciences.
‡ Rosalie Frances De Giovanni-Donnelly is Adjunct Professor of Microbiology in the G.W.U. School of Medicine and Health Sciences.
§ For description of Micr 201 see the *School of Medicine and Health Sciences Bulletin*.

235 **Systematic Bacteriology** (2) Hugh
History of bacterial classification, international rules of bacterial nomencla-
ture, development of bacterial classification based on relationships, charac-
teristics of bacterial groups. Prerequisite: Micr 212 or equivalent. (Fall
odd years)

250 **Pathogenesis of Microbial Infections** (1) Hugh
Physiological, anatomical, pathological, genetic, and biochemical bases for
the pathogenesis of selected bacterial, mycotic, viral, and parasitic infections
in humans. Host and agent factors that specifically influence resistance to
infection. For medical students, open to graduate students. Prerequisite: Micr
201 or 212 and 213. (Fall)

252 **Medical Parasitology** (1) Turner
Lecture and laboratory course. The life cycles, epidemiology, clinical man
festations, pathology, diagnosis, treatment, and prevention of medically
important protozoan and helminthic infections. In the laboratory, emphasis is
placed on the recognition and identification of the etiologic agents causing
disease through the study of living and preserved specimens. For medica
students; open to graduate students. (Fall) Staf

255 **Clinical Virology** (1)
General principles of virology; emphasis on clinical situations. For medica
students; open to graduate students. Prerequisite: Micr 201 or equivalent
(Fall)

258 **Microbial Genetics** (2) De Giovanni-Donnelly
Survey of microbial systems that depict basic concepts of genetic principles
(Spring) Kim

260 **Cellular Immunology** (1)
Advanced seminars in cellular aspects of the immune response. Conten
differs each time course is offered. May be repeated for credit. Prerequisite
Micr 229. (Spring) Staf

277–78 **Seminar: Microbiology** (1–1) Staf
Required of graduate students. (Academic year)

293 **Special Topics in Microbiology** (arr.)
Selected topics in microbiology. May be repeated for credit. (Fall and
spring) Staf

294 **Research in Clinical Microbiology** (3)
Development and/or evaluation of techniques, procedures, or instrumen-
tion related to clinical microbiology. Limited to students in the master
program in clinical microbiology. Offered jointly by the Microbiology and
Pathology Departments. Staf

295 **Research in Microbiology** (arr.)
Content differs each time the course is offered; may be repeated for credit
(Fall and spring) Staf

299–300 **Thesis Research** (3–3) Staf
(Fall and spring)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examina-
tion. May be repeated for credit. (Fall and spring) Staf

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit
(Fall and spring) Staf

## MIDDLE EASTERN STUDIES

*Program Committee:* M.A. Atkin, N. Brown, M. Gordon, R.K. Lewis, W.H. Lewis, Reich, H.M. Sachar

The School of International Affairs offers multidisciplinary programs leading to Bachelor of Arts with a major in Middle Eastern studies and to a Master of Arts in field of Middle Eastern studies.

**Bachelor of Arts with a major in Middle Eastern studies—The following requirements must be fulfilled.**

1. The general requirements stated under the School of International Affairs.
2. Prerequisite courses—see the School of International Affairs, Curriculum Requirements.
3. **Required courses for the major—(a) 6 semester hours of a third year of a modern foreign language; (b) 3 hours of either religion, art, philosophy, or literature of the Middle East; (c) 3 semester hours selected from Geog 125, 127, 132, 145, 146, or 154; (d) 6 semester hours selected from Hist 107, 108, 109, 110, 158, 193, or 194; (e) 6 semester hours selected from PSc 177, 178, 179, or 180; (f) 6 semester hours selected from Econ 136, 181, or 182; (g) 9 semester hours of course work in economics, history, or political science not related to the Middle East, to be selected in consultation with and approved by the advisor; (h) 6 semester hours of research and writing seminar related to the Middle East and taken in the discipline of concentration.**

**Master of Arts in the field of Middle Eastern studies—Prerequisite: the admission requirements stated under the School of International Affairs. Required: the general requirements stated under the School of International Affairs.**

The program offers a 30-semester-hour option with a thesis or a 36-semester-hour option without a thesis.

All students must pass a reading knowledge examination in a modern Middle Eastern language, such as Turkish, Arabic, Hebrew, or Persian (Farsi), or, with approval of the program director, French, Italian, Spanish, and Russian.

Major fields offered in the program are the domestic politics of the Middle East, international relations of the Middle East, and modern history of the Middle East. All students must take at least one course in each of the three major fields and three courses in one of the major fields.

Minor fields may be chosen from either or both of the above fields that are not chosen as the major field or from Middle Eastern economics, geography, anthropology, religions, philosophy, and art, or from an approved field offered in another program in the School of International Affairs.

Master's Comprehensive Examinations must be taken in the major field and in two minor fields by those in the thesis option and in three minor fields by those in the nonthesis option.

The following graduate courses are applicable to Middle Eastern studies.

Anth 220 *The Anthropology of Development*
Anth 221 *Key Variables in the Development Process*
Anth 222 *Issues in Development*
Anth 263 *Seminar: Culture Contact and Change*
Anth 267 *Economic Anthropology*
Anth 268 *Seminar: Peasant Society*
Anth 269 *Seminar: Structural Problems*
Econ 236 *Middle East Economics*
Econ 281–82 *International Economics*
Econ 235 *Energy Resources and Policy*
Econ 237 *Economics of the Environment and Natural Resources*
Geog 222 *Seminar: Resources and the Environment*
Geog 223 *The Polulation Food Balance*
Geog 224 *Seminar Political Geography*
Geog 250 *Regional Development*
Hist 209 *Readings/Research Seminar: Topics in Ancient History*
Hist 248 *Readings Seminar: Modern Near Eastern History*
Hist 292 *Israel, Zionism, and the Arab World*
Hist 294 *Research Seminar: The Modern Near East*
PSc 277 *Government and Politics of the Middle East*
PSc 278 *International Relations of the Middle East*
PSc 279 *The Powers in the Middle East*
PSc 280 *Government and Politics of North Africa*

Rel 209 *Seminar: Biblical Studies*
Rel 213 *Seminar: Judaism in Late Antiquity*
Rel 238 *Seminar: Contemporary Judaism*
Rel 291–92 *Readings and Research*
Rel 770 *Islamic Civilization and the West*
Rel 771 *Persian Sufi Literature in East and West*
Rel 772 *Mysticism—East and West*
Rel 777 *Religion and Science*

## MUSEUM STUDIES—GRADUATE PROGRAM

**Committee on Museum Studies**
M.C. Malaro (Director), A.D. Andrews, R.L. Humphrey, M.P. Lader, C.R. Rose, J. Vlach, H.B. Wagner

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degree of Master of Arts in the field of museum studies. The program is designed for those who seek a deepening of their primary academic interest along with training in the broad range of talents required in the successful operation of museums. The goal of the program is to produce graduates who are prepared to assume museum positions that require both scholarship and functional skills. (Students whose career interests are primarily curatorial should consider applying for the Master of Arts in their academic discipline with a concentration in museum training.)

Students applying for candidacy in the Museum Studies Program must meet all general requirements for admission to the Graduate School of Arts and Sciences. The student must have an undergraduate major, or its equivalent, relevant to the proposed academic core and at least 9 credit hours in a museum-related field other than the undergraduate major or must show equivalent preparation.

Courses relating to museum studies are offered by other departments of the University such as Anthropology, American Studies, Art, and Education. With the approval of the advisor, students may draw on these courses in formulating their programs.

The Committee on Museum Studies serves the Museum Studies Program in an advisory capacity. Its members are drawn from several departments of the University and from the Smithsonian Institution.

*Master of Arts in the field of museum studies*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The degree requires a minimum of 42 hours of course work. At least 15 hours of course work must be in an academic discipline, for example, American studies, anthropology, biological sciences, geology and paleobiology, history, or an appropriate interdisciplinary combination. At least 15 hours of course work must be in museum studies, which may include museum administration, collections management, exhibiting, and object care and conservation. At least 6 hours must be in a museum internship in the Washington area or elsewhere. The student must pass a comprehensive examination based on course work and submit a research paper.

201 **Introduction to Museum Studies: History and Philosophy of Museums** (3)
Museums viewed from historical, philosophical, and practical perspectives. Examination and comparison of types of collecting organizations. Analysis of contemporary studies on the status of museums and their public programs. (Fall)

202 **Introduction to Museum Studies: Administration** (3)
Overall operation of the museum: legal status of the museum and its obligations to the public; governance, staffing, policy-making, financial planning. Theory applied to practical situations. (Spring)

203 **Fiscal Management of Nonprofit Organizations** (3)
Basic concepts of general accounting; fund accounting for nonprofit organizations; appropriation and encumbrance accounting, budgets and budgetary systems; use of the budget as a management tool. (Spring)

215 **Collections Management: Legal and Ethical Issues** (3) Malaro
Establishing collections policies: laws, regulations, conventions, and codes that affect acquisitions, deaccessions, loans, and collection care; accountability; access problems. (Fall)

216 **Collections Management: Practical Applications** (3) K. Spiess
The implementation of collections policies: cataloging, documentation, records maintenance, object preservation, storage techniques, handling and shipping, inventory control, data systems. (Spring)

270 **Curatorial Research and Exhibition Development** (3) Taylor
Museum research from a curatorial point of view, with emphasis on exhibit conceptualization and development. Research techniques, information sources, script production. (Fall)

271 **Seminar: Museum Exhibiting** (3) Staff
The collaboration between curator and designer. The designer's task as visualizer. Project management of both simple and complex exhibits in various disciplines. Installation techniques. Hypothetical projects developed by student teams. (Spring)

291 **Museum Internship** (3 or 6) Malaro
Individual work experience in museums of the Washington area and possibly elsewhere. Each student should make arrangements with the Director of the Museum Studies Program. Museum internships are supervised by one or more members of the cooperating museum staff in the areas of museum management, object care and conservation, exhibiting. (Fall, spring, and summer)

295 **Directed Research** (3) Staff
Individual research on special topics in the museum field. Topics must be approved by the Director of the Museum Studies Program. May be repeated for credit. (Fall, spring, and summer)

297 **Special Topics in the Museum Field** (3) Staff
May be repeated for credit provided the topic differs. (Fall, spring, and summer)

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Related museum studies courses offered by other departments.

AmCv 251 *Museum Research and Education*
AmCv/Anth 294 *Field and Laboratory Research in Archaeology*
Anth 264 *Seminar: Anthropological Museum Techniques*
Art 209–10 *Exhibition and Display Design*
Art/Anth 292 *Introduction to Conservation*
Art/Anth 293 *Preventive Conservation Techniques*
Art/Anth 212 *Advanced Conservation Techniques*
Educ 240 *Proposal Writing*
Educ/AmCv 286 *Interpretation in the Historic House Museum*
Educ 311 *Museum Audiences*
Educ 313 *Museum Evaluation*

## MUSIC

Professors C. Steiner, R. Parris
Adjunct Professor G.B. Delente
Associate Professors N.A. Tilkens, R.J. Guenther *(Chair)*
Adjunct Associate Professor M. Garst *(Piano)*
Associate Professorial Lecturer U.A.W. Grahn
Assistant Professor C.J. Pickar
Adjunct Assistant Professors J.E. White *(Voice)*, S.K. Kim *(Piano)*, J. Albertson *(Guitar)*, F.B. Conlon *(Piano)*, S. Prussing *(Voice)*, M. Sislen *(Guitar)*, A. Lee *(Voice)*
Assistant Professorial Lecturers B. Feinstein, C.M. Dunham

Studio Instructors M. Findley (*Violin*), K. Fleming (*Cello*), P. Gieseler (*Voice*), E
Guenther (*Organ*), N.M. Irvine (*Bass*), S.E. King (*Recorder*), L. Lipnick (*Bassoon*), W.H
Mann (*Flute*), R.J. Pallansch (*Tuba*), R. Parnas (*Violin and Viola*), B.R. Seidman (*Harp*
S. Wellman (*Voice*), R. White (*Oboe*), W.R. Wright (*Clarinet and Saxophone*), W.A
Baughman (*Trumpet*), P. Edgar (*Percussion*), S.M. Fearing (*French Horn*), E.C. Thayer
(*French Horn*), E.U. Kiehl (*Trombone*), J.D. Levy (*Jazz Improvisation*), C.H. Thomas
(*Electric Bass*), M. Von Villas (*Opera*), J. Beck (*Percussion*), A. Wittrup (*Piano*), P.
Dahlman (*Piano*), T. Perazzoli (*Flute*)

*Bachelor of Arts with a major in music (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences
2. Prerequisite courses—Mus 1–2, 5–6; 6 hours of applied music courses in the student's principal performance area.
3. The language proficiency option listed under General Curriculum Requirements Columbian College of Arts and Sciences.
4. Required courses in the major—Mus 101–2, 103–4, 131–32, 138, 151; 6 additional hours of applied music courses; a minimum of 4 hours of music ensemble courses. Students preparing for graduate study or professional concentration in music may elect further program of specialization in music literature, theory, or applied music. Music majors must meet the departmental requirement for proficiency in piano. All majors are expected to perform regularly in student recitals in accordance with minimum departmental requirements.

*Bachelor of Music*—Admission to the Bachelor of Music degree program requires demonstration of special advanced pre-admission training and aptitude. In addition to the general requirements stated under Columbian College of Arts and Sciences, the 120-credit-hour program requires music courses as follows: Mus 1–2, 5–6, 101–2, 103–4, 131–32, 138–39, 151, 199; 6 hours of ensemble courses; 12 hours of applied music courses; 15 hours of additional courses in the area of concentration (theory or performance); and 5 hours of electives. Students in this program are strongly encouraged to pursue the language proficiency option listed under General Curriculum Requirements, Columbian College of Arts and Sciences.

*Minor in Music*—20 semester hours of music courses, consisting of Mus 1–2 or 5–6, two music history courses (Mus 101–2 or 103–4), 4 semester hours of piano study, and 2 semester hours of ensemble participation. Students with sufficient piano proficiency, as determined by an audition, may elect another applied music area for concentration. Recital attendance and public performance are required.

*Master of Arts in the field of music*—Prerequisite: a bachelor's degree with a major in music or an equivalent degree; satisfactory demonstration of ability in one medium of performance; demonstration of piano proficiency as required for the Department's bachelors' degrees; completion of the Department's theory placement examination. Applicants from other institutions must present scores on the Music Subject Test of the Graduate Record Examination.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of course work, including a thesis (6 semester hours). This program includes a required core of courses from theory, history, and performance as well as electives that may include up to two approved courses outside the department. A student in this program must demonstrate, by [illegible] examination, a reading knowledge of either French or German before beginning the third semester of study.

*Master of Music in the field of performance* (piano or voice)—Prerequisite: a bachelor's degree with a major in music or an equivalent degree, an audition before a faculty committee. Applicants from other institutions must present scores on the Music Subject Test of the Graduate Record Examination.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study includes 30 semester hours distributed as follows: [illegible] semester hours of performance study in the area of concentration (piano or voice; [illegible]

semester hours of music theory and music history and literature courses; and (c) a thesis (6 semester hours). The thesis consists of a public recital and performance before a designated committee (such a recital and performance must be representative of an extensive and well-rounded repertory, performed on a professionally accepted artistic level); delivery of a historical and analytical lecture on the musical content of the recital program, also before a designated committee; a written report on some approved theoretical area related to the student's concentration; and demonstrated leadership in an ensemble performance (opera or oratorio for voice).

**Departmental Prerequisites:** Mus 1–2 is prerequisite to all other courses required of music majors with the exception of applied music and ensemble courses. All students majoring in music are required to emphasize performance study in one instrument or voice. Placement auditions to determine the beginning level of study are administered at the time the major is declared. Satisfactory progress in the principal performance area, as determined by the department's repertoire and study-level guidelines and regular applied music jury examinations, is required for continuance in the major. Attendance at a minimum number of public concerts and recitals is required of all music majors as a part of their applied music study.

## MUSIC THEORY, HISTORY, AND LITERATURE

### First Group

1–2 **Elements of Music Theory** (4–4) **Pickar**
Notation, scales, keys, intervals, terms, rhythms, and chord structure and progression, both written and at the piano keyboard. Aural skills development through melodic, harmonic, and rhythmic dictation and sight singing. Introduction to music literature, with emphasis on rudimentary aural analysis. Two 50-minute lab sessions per week. Mus 1 is prerequisite to Mus 2. (Academic year)

3 **Introduction to Musical Understanding** (3) Guenther and Staff
Introductory history of musical styles, related to listening, study of music materials and media. Not open to music majors. (Fall and spring)

4 **Survey of Music Literature** (3) Staff
Introductory study of musical forms, structures, and textures; aural analysis of selected literature. Not open to music majors. (Spring)

5–6 **Harmony** (4–4) Parris
Triads, inversions; chord analysis, construction, and progression; figured-bass realization, part writing, modulation, altered chords. Prerequisite: Mus 1–2; Mus 5 is prerequisite to Mus 6. (Academic year)

7 **Music of Non-Western Cultures** (3) Staff
Introductory survey of the basic systems and styles of music in the major cultures of the Eastern Hemisphere and Africa.

8 **History of Jazz** (3) Dunham
Introduction to the styles, composers, and performers of jazz music from its origins to the present. (Fall)

### Second Group

101–2 **History of Music I** (3–3) Tilkens
Development of music in the Western world from the early Christian era through the Baroque. Mus 101 is prerequisite to Mus 102. (Academic year)

103–4 **History of Music II** (3–3) Tilkens
Development of Western music from the Classical period to the present. Mus 103 is prerequisite to Mus 104. (Academic year)

105 **Computers and Music** (3) Conrad
Theory and practical computer applications in sound synthesis (both analog and FM digital), MIDI controlling and communication, digital sampling and recording, and manuscript preparation and editing. Music-reading abil-

ity is assumed; extensive computer experience and knowledge of electronic music are not required. Prerequisite: Mus 1 or permission of instructor. (Fall) Staff

109 **Orchestra Literature** (3)
Survey of the history and styles of orchestra literature, analysis of representative works. Staff

110 **Chamber Music Literature** (3)
Survey of the history and styles of chamber music literature, analysis of representative works. Feinstein

121 **The Opera** (3)
Survey of the history and styles of opera, analysis of representative works. Delente

125 **Keyboard Music Literature** (3)
Survey of the history, style, and major content of the keyboard literature from the 16th century to the present. Parris

131–32 **Advanced Theory** (3–3)
Practice in 18th-century contrapuntal writing and analysis, chorale preludes, inventions, and fugues. Prerequisite: Mus 5–6 or equivalent. (Academic year) Parris, Gratto

133–34 **Composition** (3–3)
(Academic year) Parris

135 **Counterpoint** (3)
Study and practice of 16th-century contrapuntal techniques. (Spring) Parris

137 **Orchestration** (3)
Instrumental scoring. (Fall) Parris

138–39 **Form and Analysis** (3–3)
Analysis of musical forms in representative musical literature. (Academic year) Wright

151 **Conducting** (3)
Technique of conducting, score reading, rehearsal procedures, analysis, and interpretation of selected musical literature; practice in conducting. (Fall) Gratto

160–61 **Electronic Music** (3–3)
Tape and electronic techniques, synthesizer use, and acoustical principles. (Academic year) Staff

173 **Pedagogy** (3)
Principles, materials, and methods of teaching in selected areas. (Alt.

175 **Performance Practices in Selected Areas** (3)
An investigation of the problems of accurate interpretation of music of selected periods through the use of historical and modern literature and application to the actual music. Topic to be announced in the Schedule of Classes. (Fall—odd years) Staff

199 **Independent Research** (3)
Under the guidance of an assigned instructor. Open only to qualified music majors. May be repeated for credit. (Fall and spring)

**Third Group** Guenth

203 **Bibliography and Research Methodology** (3)
(Fall) Tilke

205 **Music of the Baroque Period** (3)
Study of the musical styles, techniques, and literature from 1600 to 1750. Tilke

206 **Music of the Classical Period** (3)
Study of styles, techniques, and literature from the 18th-century school through Haydn, Mozart, and Beethoven. (Fall) Guenth

207 **Music of the Romantic Period** (3)
Study of the musical styles, backgrounds, and literature from Schubert through the 19th century. Guenth

208 **Music of the 20th Century** (3)
The principal schools, techniques, developments, and trends of the 20th century. (Fall)

221–22 **Diction for Singers** (3–3) Von Villas
Pronunciation and rules of diction for the singing of Italian, French, German, and Church Latin, making use of the International Phonetic Alphabet. (Alternate academic years)

231–32 **Composition** (3–3) Parris
May be repeated for credit. (Academic year)

234 **Seminar: Performance Practices in Selected Areas** (3) Staff

237 **Seminar: Analytical Studies in Music Theory** (3) Guenther
Spring: Beethoven quartets.

238 **Seminar: Analytical Studies in Music History** (3) Tilkens
Spring: Handel.

239 **Independent Research** (3) Staff

251–52 **Advanced Conducting** (3–3) Staff
(Academic year)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

## APPLIED MUSIC

Applied music courses are offered both fall and spring, and may be repeated for credit. Mus 51, 52, 53, 54, 55, and 153 do not include individual lessons and do not require a supplementary fee. All other applied music courses include individual lessons and require a supplementary fee, as follows:

1. One-semester-hour courses: individual lessons of one-half hour a week, supplementary fee, $75.
2. Two- or three-semester-hour courses: individual lessons of one hour a week, supplementary fee, $150.

Supplementary fees for applied music courses are nonrefundable after the first three weeks of the fall and spring semesters. Consult the Music Department for details.

The supplementary fee is waived for graduate degree candidates in music and full-time undergraduate music majors and minors.

**First Group**

**Required practice:** three hours a week for one-semester-hour courses and six hours a week for two-semester-hour courses.

11 **Piano** (1)
12 **Piano** (2) Staff
13 **Voice** (1)
14 **Voice** (2) Staff
15 **Organ** (1)
16 **Organ** (2) E. Guenther
17 **Violin** (1)
18 **Violin** (2) Staff
19 **Classical Guitar** (1)
20 **Classical Guitar** (2) Albertson, Sislen
21 **Viola** (1)
22 **Viola** (2) Parnas
23 **Cello** (1)
24 **Cello** (2) Fleming
25 **Bass** (1)
26 **Bass** (2) Irvine, Thomas
27 **Flute** (1)
28 **Flute** (2) Mann, Perazzoli
29 **Recorder** (1)
30 **Recorder** (2) King
31 **Oboe** (1)
32 **Oboe** (2) R. White
33 **Clarinet** (1)
34 **Clarinet** (2) Wright

35 **Saxophone** (1)
36 **Saxophone** (2)
37 **Bassoon** (1)
38 **Bassoon** (2)
39 **French Horn** (1)
40 **French Horn** (2)
41 **Trumpet** (1)
42 **Trumpet** (2)
43 **Trombone** (1)
44 **Trombone** (2)
45 **Percussion** (1)
46 **Percussion** (2)
47 **Harp** (1)
48 **Harp** (2)
49 **Tuba** (1)
50 **Tuba** (2)
51 **Orchestra** (1)
Preparation and performance of orchestral literature. Prerequisite: audition before director.
52 **Instrumental Ensemble** (1)
Chamber ensemble groups approved by audition.
53 **University Singers** (1)
Preparation and performance of choral literature. Prerequisite: audition before director.
54 **Chamber Choir** (1)
Preparation and performance of chamber vocal literature. Prerequisite: audition before director and two semesters of Mus 53.
55 **Jazz Band** (1)
Preparation and performance of classic and contemporary "big band" literature. Prerequisite: audition before director.
57 **Harpsichord** (1)
58 **Harpsichord** (2)
59 **Jazz Performance Techniques** (1)
60 **Jazz Performance Techniques** (2)

**Second Group**

**Departmental prerequisite:** audition to meet departmental requirements.
**Required practice:** six hours a week for 1-semester-hour courses and 12 hours a week for 3-semester-hour courses. In addition, 3-semester-hour courses include master performance classes and recital preparation.

111 **Piano** (1)
112 **Piano** (3)
113 **Voice** (1)
114 **Voice** (3)
115 **Organ** (1)
116 **Organ** (3)
117 **Orchestral Instrument** (1)
118 **Orchestral Instrument** (3)
119 **Classical Guitar** (1)
120 **Classical Guitar** (3)
153 **Vocal Theater Workshop** (1)
A performance-oriented program for singers of various vocal abilities. May be repeated for credit. In the fall semester the stress will be on development of body awareness for the stage, acting improvisations, and character development. Scenes will be chosen (with the approval of the voice faculty) from opera, operetta, and musical theater repertoire. In the spring semester musical coaching, use of makeup, and audition preparation will be included.

155 **Voice Study for the Theatre** (1) Staff
156 **Voice Study for the Theatre** (3) Staff
157 **Harpsichord** (1) Garst, Parris
158 **Harpsichord** (3)

**Third Group**

All courses include supervised ensemble preparation and required concert solo performances.

211 **Piano** (3)
213 **Voice** (3)
215 **Organ** (3)
217 **Orchestral Instrument** (3)

## NAVAL SCIENCE

Professor O.C. Martin *(Chair)*
Associate Professor D.M. Hirabayashi
Assistant Professors T.R. Timmerman III, D.P. Soukup, G. Johnson, J.J. Jackson

**Naval Reserve Officers Training Corps Program**

The Naval Reserve Officers Training Corps (NROTC) offers young men and women the opportunity to qualify for a full scholarship and a commission in the Navy or Marine Corps. NROTC midshipmen are required to complete the naval science courses and attend weekly professional seminars. During the summer, NROTC midshipmen participate in active duty at sea or on shore-based training cruises for approximately four weeks. Upon receiving the baccalaureate and completing the NROTC program, qualified midshipmen are commissioned as ensigns in the Navy or second lieutenants in the Marine Corps. Students may join the NROTC through any one of the following four programs.

*Four-Year Scholarship Program*—Students enter the NROTC Four-Year Scholarship Program through national competition and are appointed midshipmen in the Naval Reserve. While enrolled, the government provides tuition, fees, books, uniforms, and an allowance of $100 per month. Upon graduation, students are commissioned with an eight-year active/reserve service obligation that consists of at least four years of active duty. Scholarship Program students must include courses in English, calculus, computer science, physics, national security policy, a foreign language, technical electives, and naval science in their degree program and participate in three summer training periods of approximately four weeks each.

*Two-Year Scholarship Program*—Selection for this program is made through national competition, based on the student's academic record, physical qualifications, and an interview. Application should be made by the start of the fall semester of the student's sophomore year. Selected applicants attend six weeks of instruction at the Naval Science Institute (NSI) at Newport, Rhode Island, during the summer before their third academic year. At NSI, students take courses in naval science, physical fitness, and drill, similar to those required of four-year NROTC students during their freshman and sophomore years. Successful completion of the NSI qualifies the two-year applicants for appointment as midshipmen in the Naval Reserve and enrollment in the NROTC Scholarship Program. Upon acceptance of this appointment, students receive all the benefits and assume all the obligations of midshipmen in the Four-Year Scholarship Program.

*Four-Year College Program*—Students are enrolled in the Four-Year College Program upon acceptance by the Department of Naval Science. Uniforms are provided, and during their junior and senior years, students receive $100 per month. Students must include courses in mathematics, science, and naval science in their degree program, attend the first class summer at-sea training period, accept a commission in the Naval Reserve or Marine Corps Reserve on graduation with an eight-year active-reserve service obligation, and serve on active duty after graduation for at least three years. After commissioning, application for transfer to the regular Navy or Marine Corps may be made. Midshipmen who complete one term as College Program students, have a satisfactory academic record,

and are physically qualified may compete for a scholarship awarded by the Chief of Naval Education and Training. College Program students who demonstrate academic excellence may be nominated for NROTC Scholarships by the Professor of Naval Science. If awarded, the scholarship will be for the remainder of the student's undergraduate enrollment, up to a maximum of three and a half years; service requirements and benefits are the same as for the scholarship programs.

*Two-Year College Program*—Application should be made by the start of the spring semester of the student's second year. Selections are made through the Department of Naval Science, based on the student's academic record, physical qualifications, and an interview. Those students selected will attend the NSI and upon successful completion may enroll in the program. The benefits and obligations are the same as for the Four-Year College Program.

*Requirements for all candidates*—Qualifications for acceptable candidates for the Scholarship Program or the College Program include U.S. citizenship, fulfillment of physical requirements, and willingness to participate in required summer training periods and to accept a commission in the Navy, Marine Corps, Naval Reserve, or Marine Corps Reserve when offered.

Enrollment in NROTC is not a requirement for taking naval science courses. Any student enrolled at George Washington University may take naval science courses with the approval of the Professor of Naval Science.

**Degree Credit for Naval Science Courses**

*Columbian College*—NSc 126, 160, and 180 are acceptable as history electives. Up to 12 credit hours (for NSc 52, 150, 175, and 176) may be accepted as professional electives in Columbian College.

*School of Education and Human Development*—NSc 126, 160, 175, 176, and 180 may be accepted for social science elective credit in the following undergraduate programs: elementary education, human services, and special education. All naval science courses are acceptable as elective credit in the travel and tourism and exercise and sport science programs.

*School of Government and Business Administration*—NSc 175 and 176 may be used as equivalents for BAd 191 and 110, respectively, by students in both the B.B.A. and B.Acct. degree programs. For B.B.A. students, any other naval science courses may be used to fulfill science, social science, or elective requirements. For B.Acct. students, any one of the remaining naval science courses may be used to fill an elective requirement.

*School of International Affairs*—NSc 126, 160, and 180 may be used as elective credit in all undergraduate programs.

51 **Introduction to Naval Science** (3)
A general introduction to the naval profession and to concepts of sea power. The mission, organization, and warfare components of the U.S. Navy and Marine Corps. Overview of officer and enlisted ranks and rates, training, education, and career patterns. Naval courtesy and customs, military justice, leadership, and nomenclature. Professional competencies required to become a naval officer.

52 **Naval Ships Systems I (Engineering)** (3)
A detailed study of ship characteristics and types, including ship design, control, propulsion, hydrodynamic forces, stability, compartmentation, electrical and auxiliary systems, interior communication, and damage control. Included are basic concepts of the theory and design of steam, gas turbine, and nuclear propulsion. Shipboard safety and firefighting.

125 **Naval Ships Systems II (Weapons)** (3)
Theory and employment of weapons systems, including the process of detection, evaluation, threat analysis, weapon selection, delivery, guidance, and explosives. Fire control systems and major weapons types, their capabilities and limitations. Physical aspects of radar and underwater sound. Facets of command, control, and communications as means of weapon system integration.

126 **Sea Power and Maritime Affairs** (3)
A survey of the U.S. naval history, from the American Revolution to the present, with emphasis on major developments. The geopolitical theory of Mahan. Present-day concerns in sea power and maritime affairs, including the economic and political issues of merchant marine commerce, the law of the sea, the Russian navy and merchant marine, and a comparison of U.S. and Soviet naval strategies.

150 **Navigation and Naval Operations I** (3)
An in-depth study of piloting and celestial navigation, including theory, principles, and procedures. Students develop practical skills in both piloting and celestial navigation. The use of charts, visual and electronic aids, and the theory and operation of magnetic and gyro compasses. The celestial coordinate system; spherical trigonometry, theory and operation of the sextant, and a step-by-step treatment of the sight-reduction process. Other topics include tides, currents, effects of wind and weather, plotting, use of navigation instruments, types and characteristics of electronic navigation systems, and a day's work in navigation.

151 **Navigation and Naval Operations II** (3)
A study of the international and inland rules of the nautical road, relative-motion vector-analysis theory, relative motion problems, formation tactics, and ship employment. Introduction to naval operations and operations analysis, ship behavior and characteristics in maneuvering, applied aspects of ship handling, and afloat communications.

160 **Evolution of Warfare** (3)
This course traces the development of warfare, from the dawn of recorded history to the present, with focus on the impact of major military theorists, strategists, tacticians, and technological developments. The student acquires a basic sense of strategy, develops an understanding of military alternatives, and sees the impact of historical precedent on military thought and actions.

175 **Leadership and Management I** (3)
A comprehensive study of organizational behavior and management in the context of naval organization. Survey of the management functions of planning, organizing, and controlling. Introduction to individual and group behavior in organizations and extensive study of motivation and leadership. Major behavioral theories. Practical applications are explored by the use of experiential exercises, case studies, and laboratory discussions. Other topics developed include decision making, communication, responsibility, authority, and accountability.

176 **Leadership and Management II** (3)
A survey of the interaction of leadership, organizational behavior, and human resource management. Employee interviewing and counseling, performance appraisals, business correspondence, military and civilian law, and managerial ethics and values. This capstone course in the naval science curriculum builds on and integrates professional competencies to develop a thorough understanding of the problems and issues faced by leaders, managers, and naval officers.

180 **Amphibious Warfare** (3)
A historical survey of the development of amphibious doctrine and the conduct of amphibious operations. The evolution of amphibious warfare in the 20th century, especially during World War II. Present-day potential and limitations on amphibious operations, including the rapid deployment force concept.

## PATHOLOGY—GRADUATE PROGRAMS

*Professors* H. Sidransky (*Chair*), S. Bloom, B.C. Zook (*Comparative Pathology*)
*Associate Professors* S.G. Kent, Y. Al-Doory, C.T. Garrett, J.M. Orenstein, S. Silver, D.S. Wilkinson, G.A Clawson
*Assistant Professor* A.M. Schwartz

*Master of Science in the field of clinical microbiology (supervisory track)*—A program offered jointly by the Microbiology and Pathology Departments. Prerequisite: a bachelor's degree in medical technology or in biological or physical science and a minimum of three years of experience, within the last five years, in a clinical laboratory.

Required: the general requirements stated under the Graduate School of Arts and Sciences. This is a nonthesis program requiring a total of 36 semester hours, including Bioc 221–22; Micr 225–226; Path 230, 231, 232; Micr or Path 294; and Stat 127. The remaining academic work should consist of graduate-level courses selected with the approval of the Microbiology and Pathology Departments.

*Doctor of Philosophy in the field of pathology*—Prerequisite: one of the following degrees from a recognized professional school: Doctor of Medicine (M.D.), Doctor of Veterinary Medicine (D.V.M.), or Doctor of Dentistry (D.D.S.). In exceptional cases applicants with other backgrounds in the life sciences may be accepted. Qualifying scores on the Aptitude Test (Verbal, Quantitative, and Analytical) of the Graduate Record Examination are required. Some students may be required to take the Biology (Advanced Specific Field) examination as well.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 48 semester hours of approved graduate course work. One year of experience in pathology at the University Hospital, equivalent to Path 283, may be counted for a maximum of 24 semester hours of graduate course work. Other experience must satisfy the eligibility requirements of the appropriate national certifying body, i.e., the American Board of Pathology in the case of the M.D., the American College of Veterinary Pathologists in the case of the D.V.M., and the American Board of Oral Pathology in the case of the D.D.S.

*Research fields*: comparative pathology, human pathology, veterinary pathology, biochemical pathology, cardiovascular pathology, and nutritional deficiency pathology.

(Undergraduate programs in medical laboratory technique and medical technology are described in the School of Medicine and Health Sciences *Bulletin*.)

**203–4 Pathology (4–4)** Kent and Staff
General introduction to concepts of disease. Pathology of organ systems correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path 203: Anat 202, 203, 204, 205; or equivalent. Prerequisite to Path 204: Path 203. (Academic year)

**220 Medical Mycology (2)** Al-Doory
Lecture and laboratory course covering pathogenic fungi, mycotic diseases and their clinical aspects. (Fall)

**222 Opportunistic Mycoses (2)** Al-Doory
Study of the opportunistic fungal infections and their serological, clinical and therapeutic aspects. Emphasis on identification of fungi and evaluation of laboratory findings. (Spring)

**230 Pathology and Pathophysiology of Infections (3)** Staff
An interdepartmental course dealing with the pathophysiology of host response to injury, with emphasis on, but not restricted to, infectious agents. (Fall)

**231 Laboratory Supervisory Clerkship (1)** Staff
Students will rotate through selected clinical microbiology laboratories (hospital, public health, and commercial) to observe the techniques and supervision employed in each setting. Hospital laboratories will range from small community facilities to large medical center facilities. Generally

students will spend a maximum of one week in each laboratory. The type of clerkship a student is required to fulfill will be determined individually, based on past experience. Open only to degree candidates in the clinical microbiology program. (Fall, spring, and summer)

232 **Laboratory Management Seminar** (1) Silver
Management techniques related to the clinical microbiology laboratory environment. Open only to degree candidates in the clinical microbiology program. (Fall and spring)

256 **Pathology of Infectious Diseases** (3) Abraham*
Correlation of clinical, physiologic, immunologic, and pathologic mechanisms determining the course and morphological changes that occur in infections. Analysis of cases and review of assigned readings. Prerequisite: Micr 211 and Path 203.

257 **Transmission Electron Microscopy in Pathologic Diagnosis** (3) Orenstein, Abraham
Techniques for the examination and interpretation of ultrastructural changes associated with human disease states. Emphasis on transmission electron microscopy as a diagnostic tool. Prerequisite: Path 203, 204; Anat 260, 261.

258 **Organ System Pathology** (5) Bloom
Gross and microscopic study of human pathologic material reflecting major diseases of specific organ systems. The organ systems studied will be rotated annually, depending on demand. Organ systems to be covered include cardiovascular, digestive, nervous, renal, reproductive, and respiratory. Prerequisite: Path 203, 204, and permission of instructor. (Fall and spring)

276 **Seminar in Experimental Pathology** (1) Staff
Presentations on current topics in experimental pathology. (Fall and spring)

283 **Anatomic Pathology Clerkship** (arr.) Staff
Necropsy and surgical pathology service. Prerequisite: Path 203–4 or equivalent. Five semester hours of credit for each four-week period. Students may receive up to 30 semester hours of credit for six months full-time. Open to limited number of graduate students, with permission.

286 **Perinatal Pathology** (arr.) Kent
Course will focus on the important disorders that may beset the human fetus and the newborn infant. Emphasis on the role of placental abnormalities. Prerequisite: Path 203, 204, and permission of instructor. (Spring)

294 **Research in Clinical Microbiology** (3) Silver
Development and/or evaluation of techniques, procedures, or instrumentation related to clinical microbiology. Limited to students in the master's program in clinical microbiology. Offered jointly by the Microbiology and Pathology Departments.

295 **Comparative Pathology** (arr.) Zook, Montali†
Participation in veterinary pathology service, including studies of domestic, wild, and laboratory animals. Review of training materials and participation in training sessions. Graduate students receive 5 semester hours of credit for each four-week full-time period. Prerequisite: Path 203–4.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

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* Andreas Andrew Abraham is Associate Professor of Pathology at the G.W.U. School of Medicine and Health Sciences

† Richard J. Montali is Adjunct Associate Professor of Pathology (Comparative Pathology) at the G.W.U. School of Medicine and Health Sciences

## PHARMACOLOGY

*Professors* H.G. Mandel *(Chair)*, V.H. Cohn, P. Mazel, J.A. Straw, P. Klubes, F.P. Abramson
*Professorial Lecturer* J. Axelrod
*Associate Professor* K.A. Kennedy
*Assistant Professors* D.C. Perry, R.J. Valentino

*Master of Science in the field of pharmacology*—Prerequisite: a Bachelor of Arts or Bachelor of Science degree. The undergraduate program must have included the following courses, or equivalent: BiSc 11–12; Phys 1, 2; Math 31, 32; Chem 11–12, 2[illegible] 151–52, 153–54. A course in physical chemistry is also recommended.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Bioc 221–22; Phyl 201, 212; Phar 203, 205, 299–300.

*Doctor of Philosophy in the field of pharmacology*—Required: the general requirements stated under the Graduate School of Arts and Sciences.

*Research fields*: behavioral pharmacology, biochemical pharmacology and toxicology, cancer chemotherapy, carcinogenesis, drug metabolism, drug assay methodology, molecular pharmacology, neuropharmacology, genetic toxicology, cardiovascular pharmacology, pharmacokinetics, pharmacology of drug abuse, and neuroendocrine pharmacology.

### Second Group

**114 Drugs and the Consumer (3)** Cohn and Staff
General concepts of drug action in the body. Action mechanism of some specific prescription and nonprescription drugs, including contraceptives, tranquilizers and sleep-inducing drugs; hayfever, headache, and cold remedies; analgesics; antibiotics; vitamins. Issues related to development and marketing of drugs, drug safety, drug advertising, generic versus trade-name drugs, drug use in sports, drug use during pregnancy, smoking and health. No science prerequisites. Limited enrollment. (Fall) Cohn

**115 Nonmedical Use of Licit and Illicit Drugs (3)**
Psychological and sociological bases of recreational and other nonmedical use of drugs, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems, legal and societal implications of and reactions to the nonmedical use of drugs, prevention and treatment of drug dependence. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana, hallucinogenic and psychedelic drugs. There are no science prerequisites. (Spring) Straw and Staff

**158 Pharmacology for New Health Practitioners (4)**
For students in allied health programs; open to graduate students with permission of the instructor. Drug disposition; autonomic nervous system; cardiovascular, and gastrointestinal drugs; psychopharmacology; analgesics, sedatives, anticonvulsants; chemotherapy, toxicology, endocrinology. Prerequisite: Anat 115, Phyl 111.

### Third Group

Cohn and Staff

**203 Fundamental Principles of Pharmacology and Toxicology (3)**
Basic principles of pharmacology, including drug receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms; mechanisms of mutagenesis, carcinogenesis, teratogenesis, and specific organ toxicity; risk assessment and extrapolation. Admission by permission of the instructor. (Fall) Cohn and Staff

**205 Pharmacology (8)**
Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis of rational disease therapy. Prerequisite: Phar 203, courses in biochemistry and physiology, or approval of department. (Fall)

220 **Molecular Events in Toxic Actions** (2) Kennedy
Metabolism of xenobiotics to cytotoxic products. Environmental and genetic factors influencing toxic actions. Molecular mechanisms of toxicity. Prerequisite: Phar 203. (Spring)

222 **Genetic Toxicology** (2) Staff
The action of chemicals and radiation in the induction of DNA damage and repair *in vitro* and *in vivo* and the sequelae of these processes in cells and mammals. DNA repair mechanisms, mammalian cell toxicity, mutagenesis, and carcinogenesis. Prerequisite: Bioc 221–22. (Spring)

230 **Special Topics in Toxicology** (arr.) Staff
Selected aspects of toxicology. Content differs each time the course is offered. May be repeated for credit. (Fall and spring)

254 **Frontiers in Pharmacology** (1) Mandel and Staff
Recent advances and research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)

258 **Cancer Chemotherapy** (1) Mandel and Staff
Mechanisms by which drugs inhibit the growth of tumor cells. (Spring, even years)

259 **Readings: Cancer and Cancer Chemotherapy** (2) Klubes
Selected readings and discussion of recent advances in cancer and cancer chemotherapy research. Prerequisite: Phar 201 or 205. (Spring, odd years)

269 **Pharmacology Seminar** (1) Mandel
Recent advances in pharmacology. Content differs each time the course is offered; may be repeated once for credit. (Fall)

272 **Physiological Disposition of Drugs** (3) Cohn
Mechanisms for the absorption, distribution, metabolism, and excretion of drugs and the physical, chemical, and biological factors affecting these processes are studied through extensive reading of classical and current original literature. Prerequisite: Bioc 221–22, Phar 203, or permission of the instructor. (Spring)

273 **Pharmacokinetics: Principles and Applications** (2) Abramson and Staff
A description of compartmental and physiological models of drug disposition. Problem solving to obtain rate constants, organ clearances, etc., from experimental data. Examples of drug disposition exemplifying various pharmacokinetic approaches. (Spring)

275–76 **Advanced Topics in Pharmacology and Toxicology I–II** (1–1) Cohn and Staff
Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, laboratory techniques. (Alternate academic years)

277–78 **Advanced Topics in Pharmacology and Toxicology III–IV** (1–1) Cohn and Staff
Continuation of Phar 275–76. (Alternate academic years)

279 **Special Topics in Pharmacology** (arr.) Staff
Selected aspects of drug action. Content differs each time the course is offered, may be repeated once for credit. (Fall and spring)

280 **Neuropharmacology** (2) Perry, Valentino
Fundamental principles. Electrophysiological and biochemical techniques. Neurotransmitters and their pathways in the central nervous system. Drug effects on neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Phar 205 or equivalent. (Spring)

295 **Reading and Research** (arr.) Staff
May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

**Fourth Group**

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit (Fall and spring)

## PHILOSOPHY

*University Professor* P.J. Caws
*Professors* R.H. Schlagel, R.S. French, W.B. Griffith *(Chair)*
*Associate Professors* R.P. Churchill, J.D. Moreno, A. Altman
*Assistant Professor* J.P. Butler
*Adjunct Assistant Professor* J.F. Uebelhoer

*Bachelor of Arts with a major in philosophy (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.

2. Required courses in related areas—6 semester hours of literature courses selected from Chinese, Classics, English, French, German, Italian, Slavic, or Spanish; 6 hours selected from art history, music history, or religion; 6 hours in history (Hist 39–40 recommended).

3. Required courses in the major—a minimum of 30 semester hours, including foundational courses Phil 111, 112, 113, 131, and 152; one course selected from each of the following groups: Group A (normative)—Phil 127, 132, 142, 162; Group B (epistemological)—Phil 121, 151, 153; Group C (contemporary)—Phil 172, 192, 193; plus semester hours of elective second- or third-group courses, selected in consultation with departmental advisor.

For students expecting to continue in graduate school, it is recommended that they include in their program of study 12 semester hours of introductory French, German, or Greek language courses.

*Minor in philosophy*—Required: a minimum of 18 semester hours, including 6 hours selected from Phil 111, 112, 113 without Phil 50, or 3 hours selected from the same group of courses with Phil 50, plus 12 hours of elective philosophy courses.

*Minor in applied ethics*—Required: 18 semester hours of philosophy courses, including Phil 50, 131, 132, and 9 semester hours selected from Phil 133, 135, 142; 751 (Current Issues in Bioethics), and (for seniors with the permission of the instructor) Phil 235, 262

*Master of Arts in the field of public policy with a concentration in philosophy and social policy*—An interdisciplinary program that brings the normative, historical, and analytical-logical skills of philosophical inquiry to bear upon contemporary problems of social policy. Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Two options are available at the discretion of the faculty: (1) a minimum of 30 semester hours of approved graduate course work plus the successful completion of a thesis, or (2) a minimum of 36 semester hours of graduate course work that does not include a thesis. All students are required to take four courses selected from Phil 231, 242, 245, 255, 262, 271; and, for the public policy core, four courses selected from Phil 111, 183; Econ 217; PSc 203; Psyc 244; Stat 129 or CSci 100 (*Introduction to Computer Science*). Phil 205 is open to all students; it is required of those with insufficient background in philosophy, as determined by the department. Phil 299–300 is required for students electing to write a thesis. Each candidate must pass a Master's Comprehensive Examination based on the particular interdisciplinary composition of the student's program of study. Prospective candidates should consult Professor W.B. Griffith, chair of the department.

**First Group**

45 **Introduction to Logic** (3) Churchill
Deduction, induction, and legal reasoning; emphasis on recognition of fallacies and practical applications of logic. (Fall)

51–52 **Introduction to Philosophy** (3–3) Staff
Readings from major philosophers and study of their philosophical positions in historical, social, and cultural context. Phil 51: Classical, medieval, and early modern philosophers: Socrates through Locke. Phil 52: Enlightenment, 19th-, and 20th-century philosophers: Hume through Sartre. (Academic year)

71 **Philosophy and Literature** (3) Butler, Caws
A study of some works of literature (mainly 20th-century novels) that serve as vehicles for the working out, expression, and communication of philosophical ideas. (Spring)

**Second Group**

111 **History of Ancient Philosophy** (3) Schlagel
History of Western philosophy from early Greece, including the Near East, with major emphasis on the Pre-Socratics, Socrates, Plato, and Aristotle. (Fall)

112 **History of Modern Philosophy** (3) Churchill
History of Western philosophy of the 17th and 18th centuries: Continental Rationalism and British Empiricism from the scientific revolution through the Enlightenment; major emphasis on Hobbes, Descartes, Spinoza, Locke, Berkeley, Hume, and Kant. (Spring)

113 **19th-Century Philosophy** (3) Altman
European philosophy of the 19th century, with major emphasis on Kant, Hegel, Schopenhauer, Kierkegaard, and Nietzsche. (Fall)

121 **Symbolic Logic** (3) Griffith
Formal evaluation of deductive arguments in politics, law, economics, etc. Additional topics: metatheory of deductive systems; modal logics; logic and computers. Prerequisite: some knowledge of propositional logic or permission of instructor. (Spring)

125 **Philosophy of Race and Gender** (3) Butler
An examination of race and gender as social categories that define personal and social identity. Readings from Beauvoir, Fanon, Foucault, Sartre, and a variety of literary narratives. (Fall)

127 **Theories of History and Society** (3) Altman
Major philosophical accounts of the course of history and the origins of society, including Marxist theory and its critics. Problems of how we can explain the past and predict the future. (Spring)

131 **Ethics: Theory and Applications** (3) Griffith, Altman
Main types of ethical theory: egoistic, utilitarian, self-realization, conscience, existentialism. Applications to contemporary problems. (Fall)

132 **Social and Political Philosophy** (3) Altman
Philosophical theories about how economic, political, legal, and cultural institutions should be arranged. Topics include the meaning and significance of liberty, the legitimate functions of government, the nature of rights, the moral significance of social inequality, and the meaning of democracy. (Spring)

133 **Philosophy, Nonviolence, and War** (3) Churchill
Philosophies of nonviolence, logical and moral problems of nuclear deterrence and national defense, doctrine of just war. (Fall)

135 **Ethics in Business and the Professions** (3) Uebelhoer
Basic concepts and theories of ethics for analysis of moral issues arising in business and professional practice. (Spring)

142 **Philosophy of Law** (3) Churchill, Altman
Systematic examination of fundamental concepts of law and jurisprudence; special emphasis on the relationship between law and morality. (Fall)

151 **Science and the Modern World** (3) Schlagel
Comparison of the cosmological frameworks of Aristotle, Newton, Einstein, and quantum mechanics. Emphasis on changing concepts and methodologies, modes of explanation, and ontological implications. (Spring)

152 **Knowledge, Truth, and Reality** (3) Schlagel
Inquiry into the basis and structure of knowledge, the problem of perception and independent reality, the role of language in knowledge, and the meaning and criteria of truth. Prerequisite: Phil 50 or 112 or permission of instructor. (Fall)

153 **Mind, Brain, and Artificial Intelligence** (3) Schlagel
The mind–body problem in connection with developments in neurophysiology, cognitive psychology, and artificial intelligence. Evaluation of the major philosophical positions: dualism, epiphenomenalism, double-aspect theory, identity theory (reductive physicalism), eliminative materialism, and functionalism. (Spring)

162 **Aesthetics** (3) Butler
The problem of artistic representation and the nature of aesthetic experience as related to the creation, appreciation, and criticism of art. Special emphasis on nonrepresentational works of art and their interpretation. (Spring)

172 **American Philosophy** (3) Moreno
Philosophies of Peirce, Royce, James, Dewey, and Santayana as representatives of American thought. (Spring)

192 **Analytical Philosophy** (3) Moreno
The dominant movements of recent Anglo-American philosophy—logical positivism, British ordinary language philosophy, and neopragmatism—represented by Russell, G.E. Moore, Wittgenstein, Ryle, Ayer, Goodman, Quine, etc. Prerequisite: One other second-group philosophy course. (Fall)

193 **Phenomenology and Existentialism** (3) Caws, Butler
Kierkegaard's existentialist reaction to Hegel; subjectivity and intentionality in 19th-century thought, leading to Husserl's phenomenology; the philosophy of existence in Heidegger and Sartre; the relation between existentialism and Marxism in the later work of Sartre. Prerequisite: One other second-group philosophy course. (Spring)

194 **Structuralism and Hermeneutics** (3) Caws
Structuralism in linguistics (since Saussure), anthropology (Lévi-Strauss), and literary criticism (Barthes and others) and its implications for philosophy (Foucault). The movement will be assessed in relation to other contemporary philosophical trends, especially the hermeneutics of Gadamer and Ricoeur. Prerequisite: One other second-group philosophy course. (Fall, odd years) Staff

199 **Readings and Research** (3)
(Fall and spring)

**Third Group**

201–2 **Readings and Research** (3–3) Staff
Advanced readings and reports. Investigation of special problems. (Academic year)

205 **Selected Schools and Problems** (3) Staff
An advanced review of the rise of modern empiricism, idealism, and pragmatism, with particular attention to controversies regarding problems of method, epistemology, and social and political theory. Recommended for graduate students who have majored in fields other than philosophy. (Offered as the demand warrants)

231 **Seminar: Economic Justice** (3) Griffin
Ethical and economic analysis of equity and efficiency of current U.S. income distribution patterns. Theories of justice; economic theories of distribution; assessment of redistribution policies. (Fall, even years)

235 **Ethics and Business** (3) Griffith, Lenn
Concepts and strategies of ethical analysis applied to specific business problems, e.g., risk management, plant relocation, preferential hiring, political advertising; development of theory of corporate social responsibility. Same as BAd 291. (Spring)

242 **Philosophy, Law, and Social Reform** (3) Churchill
A philosophical investigation of moral and legal rights in the American tradition, the importance of claims of right and entitlement in policy issues, and the ways legal institutions define specific rights by limiting or giving effect to our duties and liberties. (Spring, even years)

245 **Seminar: Rights and the Public Interest in Information Policy** (3) Griffith
Society's requirements for policy data versus rights to privacy; rights to self-expression and access to information; public interest in enhancing balanced discussion (FCC's "fairness doctrine," regulation of advertising, limitation on campaign expenditures). (Fall, even years)

251 **Seminar: Philosophy of Science** (3) Schlagel
Selected topics. (Fall, odd years)

252 **Seminar: Epistemology** (3) Schlagel
Critical examination of selected problems or theories of knowledge. (Fall, even years)

255 **Philosophy of the Social Sciences** (3) Moreno, Altman
Philosophic issues relating to theory, methodology, and application of the social sciences. (Spring)

262 **Seminar: Normative Issues in Foreign Policy** (3) Churchill
Selected issues on the complexities of foreign policy from a normative perspective, including the ethics of military intervention, normative constraints on the pursuit of national interest, the protection of human rights, and the democratic control of foreign policy. (Spring, odd years)

299–300 **Thesis Research** (3–3) Staff

## PHYSICAL SCIENCE

See **Chemistry**.

## PHYSICS

Professors H.H. Hobbs, O. Bergmann, **A.J. Zuchelli, F. Prats, D.R. Lehman *(Chair)*, B.L. Berman**
Adjunct Professor L.C. Maximon
Professorial Lecturers A. Ghovanlou, W.D. Lee, I.J. Coyne
Associate Professors **W.C. Parke, N.K. Khatcheressian, M.F. Taragin, E.P. Harper, W.J. Briscoe, J.R. Peverley, Z. Kuruoglu *(Visiting)***
Associate Professorial Lecturers R. Eaton III, J.W. Lightbody, M. Fatemi, M.T. Shams, M.I. Haftel, J.T. Broach
Assistant Professors **A. Mokhtari (Research), K.S. Dhuga**
Lecturer **A. Chakarji**

Bachelor of Arts with a major in physics *(departmental)*—The following requirements must be fulfilled:
1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Phys 13, 14, 15, 16 (or Phys 21, 5, 22, 6); Chem 11–12; Math 31, 32, 33.
3. Required courses in related area—CSci 100; Math 111–12.
4. Required courses in the major—Phys 151–52, 161, 162, 163, 164, 165–66, 167, 168, 195.

Bachelor of Science with a major in physics *(departmental)*—The following requirements must be fulfilled.
1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Phys 13, 14, 15, 16, (or Phys 21, 5, 22, 6, and 16 or 167); Chem 11–12; Math 31, 32, 33.

3. Required courses in related area—CSci 56; Math 111–12.
4. Required courses in the major—Phys 151–52, 163, 164, 195–96, plus three additional 100-level courses chosen with consent of departmental advisor.

For graduation with Special Honors, a student must register for Phys 195 by the beginning of the senior year. The decision to award Special Honors will be based on competence in research and general achievement in physics as evaluated by the faculty.

*Minor in physics*—Required: Phys 13, 14, 15, 16; Phys 163 and 164 or approved substitutes from 100-level physics courses.

*Master of Arts in the field of physics*—Prerequisite: a bachelor's degree with a major in physics at this University, or an equivalent degree.

1. The master's degree program with thesis—Required: the general requirements stated under the Graduate School of Arts and Sciences, and 30 semester hours of course work in physics, including Phys 211, 212, 213–14, 221–22, 299–300; plus two of the following: Phys 224, 225–26, 231, 233, 243, 244.

2. The master's degree program without thesis—Required: the general requirements stated under the Graduate School of Arts and Sciences, and 36 semester hours of course work in physics and mathematics including Phys 211, 212, 213–14, 221–22; plus two of the following: Phys 224, 225–26, 231, 233, 243, 244.

A reading knowledge of a foreign language, or the successful completion of Stat 197 with a grade of A or B, is a further requirement.

*Doctor of Philosophy in the field of physics*—Required: the general requirements stated under the Graduate School of Arts and Sciences, and the successful completion of one of the two following options: (a) two foreign language reading examinations or (b) one foreign language reading examination and completion of CSci 100 with a grade of A or B.

*Research fields*. nuclear physics—experimental and theoretical studies on the structure, electromagnetic interactions and scattering of few-body systems at low and intermediate energies, and solid-state physics—crystal growth and physical properties of whiskers.

**First Group** Briscoe, Park

1 **General Physics I** (3)
Lecture (2 hours), recitation (1 hour). Development of conceptual principles underlying modern physical knowledge; basics of mechanics, heat, and light including the classical concepts of energy, momentum, heat, temperature, entropy, and optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6.

2 **General Physics II** (3) Briscoe, Zuchelli
Lecture (2 hours), recitation (1 hour). Topics focusing upon present understanding of the physical universe and character of the atomic and subatomic worlds. Includes considerations of electric and magnetic phenomena, relativity theory, wave–particle duality, quantum theory, nuclei, and subnuclear particles. Prerequisite: Phys 1 or equivalent.

5 **General Physics Laboratory I** (1) Bergman
Laboratory complement of Phys 1 and 21. Two and a half hours. Prerequisite: concurrent or prior registration in Phys 1 or concurrent registration in Phys 21. Laboratory fee, $20.

6 **General Physics Laboratory II** (1) Mokler
Laboratory complement of Phys 2 and 22. Two and a half hours. Prerequisite: concurrent or prior registration in Phys 2 or concurrent registration in Phys 22. Laboratory fee, $20.

9 **Introduction to Astronomy I** (3) Hall
Classical through modern astronomy, with introduction to basic principles underlying astronomical systems and observations. Lectures cover electromagnetic radiation, optical instruments, and the solar system. Laboratory (2 hours) emphasizes optics and astronomical measurements. Prerequisite: High school algebra. Laboratory fee: $15. (Fall)

**10 Introduction to Astronomy II** (3) Hobbs
Continuation of Phys 9. Stellar and extragalactic astronomy, including introduction to quantum aspects of electromagnetic radiation and atomic physics, stellar spectra, and stellar evolution. Laboratory (2 hours) has the same emphasis as in Phys 9. Prerequisite: Phys 9 or equivalent. Laboratory fee, $15. (Spring)

**11–12 Introduction to Astronomy** (2–2) Hobbs
Same as Phys 9–10 without the laboratory. (Academic year)

**13 General Physics for Engineering and Applied Science** (3) Dhuga, Peverley
Lecture (3 hours), recitation and laboratory (2 hours). Development of basic principles of optics and dynamics. Topics include geometrical optics, vector algebra, statics of rigid bodies, hydrostatics, single-particle kinematics and dynamics, conservation of energy. Concurrent registration in Math 31 is required. Laboratory fee, $20.

**14 Mechanics and Thermal Physics** (3) Khatcheressian
Lecture (3 hours), recitation and laboratory (2 hours). Elementary development of mechanics for many-particle systems and basic thermodynamics. Topics include collisions, rotational motion, small vibrations, gravitation, fluid dynamics, wave motion, the ideal gas, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 13; Math 31. Laboratory fee, $20.

**15 Electricity and Magnetism** (3) Taragin
Lecture (3 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Topics include static electric fields, Coulomb's Law, Gauss's Law, electrical potential, capacitance and dielectrics, electric current and resistance, Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 14; Math 31. Laboratory fee, $20.

**16 Modern Physics** (3) Lehman
Lecture (3 hours), recitation and laboratory (2 hours). Elementary approach to the basic principles of special relativity and quantum theory. Topics include relativistic kinematics and dynamics, wave–particle duality, the hydrogen atom, Pauli's exclusion principle, x-ray spectra, the atomic nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid-state physics. Prerequisite: Phys 14, 15; Math 32. Laboratory fee, $20.

**21 University Physics I** (3) Berman
Lecture (2 hours), recitation (1 hour). Physical concepts and principles are developed using calculus. Topics include classical mechanics, heat, waves, and optics. Concurrent registration in Phys 5 is required. Prerequisite or concurrent registration: Math 31. (Fall)

**22 University Physics II** (3) Berman
Lecture (2 hours), recitation (1 hour). Continuation of Phys 21. Topics include electric and magnetic phenomena, relativity, atomic and nuclear physics. Concurrent registration in Phys 6 is required. Prerequisite: Phys 21; prerequisite or concurrent registration: Math 32. (Spring)

**Second Group**

**121 Modern Cosmology** (3) Hobbs
Nonmathematical treatment of cosmology and related subjects from astronomy and physics. Quasars, peculiar galaxies, pulsars, black holes, antimatter, etc. Prerequisite: Phys 10 or 12

**127–28 Physics in the Life Sciences** (3–3) Parke
Principles of physics applied to biological systems and to medical instrumentation, including ultrasonics, circulation dynamics, bioenergetics, optics in medicine, applications of IR and UV radiation, medical transducers, particle radiation in medicine, models of the brain, molecular biophysics. Prerequisite: Phys 2 or equivalent

151–52 **Intermediate Laboratory** (3–3) Taragin, Khatcheressian
Independent advanced work to introduce students to research techniques and use of specialized instruments. Laboratory fee, $15. (Fall and spring)

161 **Mechanics I** (3) Prats
Mechanics of mass points and rigid bodies. Newton's laws, conservation laws, Euler's equations, inertia tensor, small vibrations, and elements of Lagrange's and Hamilton's equations.

162 **Mechanics II** (3) Bergmann
Basic aspect of continua, including elasticity and fluid dynamics, strain tensor, stress tensor, equations of equilibrium, elastic waves, ideal and viscous fluids.

163 **Physical and Quantum Optics** (3) Harper
Oscillations and waves, energy and momentum of the electromagnetic field interference, diffraction, geometrical optics, optics of crystals and other media, dispersion.

164 **Thermodynamics** (3) Parke
Principles and applications of equilibrium thermodynamics, reversible processes, thermodynamic potentials, stability and phase changes.

165–66 **Electromagnetic Theory** (3–3) Zuchelli
Development of Maxwell's field equations using vector and tensor calculus electrostatics, stationary and nonstationary phenomena, basic circuit theory electromagnetic waves and radiation.

167 **Principles of Quantum Physics** (3) Briscoe, Prats
Development of logical structure and experimental bases for modern quantum mechanics. Simple examples worked out to clarify the structure; primary emphasis on conceptual framework and its mathematical realization; careful consideration of the laboratory results to which the theory is a response.

168 **Applied Quantum Physics** (3) Briscoe, Prats
Explicit applications of principles of quantum mechanics to a variety of problems in atomic, molecular, and nuclear physics. Quantum statistical mechanics developed with applications in solid state. Emphasis on explicit evaluation of solutions and the techniques required. Prerequisite: Phys 167 or equivalent.

170 **Elementary Solid-State Physics** (3) Khatcheressian
Structure of solids, lattices and lattice defects, deformation, vibrational and electronic contribution to specific heats, binding energies, electronic states in metals and semiconductors, magnetic properties of solids. Elementary methods required such as quantum mechanics and normal mode expansions are developed as needed.

175 **Nuclear Physics** (3) Berman, Lehman
Introduction to application of quantum physics in the description of nuclei and their interactions. Properties of nuclei, nuclear models, nuclear forces, and nuclear reactions are considered. Specific topics include the deuteron, n-p scattering, the optical model, the shell model, the liquid-drop model, beta decay, fission, and fusion. Prerequisite: Phys 167 or permission of instructor.

195–96 **Undergraduate Research** (3–3) Taragin
Research on problems approved by the staff. For the B.A. option, emphasis will be placed on advanced laboratory experience. For the B.S. option, the two semesters will involve advanced laboratory experience and application of computers in the solution of physics problems, respectively.

**Third Group**

Consent of a departmental graduate advisor is required for admission to all third-group courses in physics. Taylor

211 **Advanced Mechanics** (3)
Analytic methods of mechanics as a basis for modern theory; variational principles, Lagrange's equations, Hamiltonian formulation, canonical transformations, classical perturbation theory.

212 **Special Relativity** (3) Bergmann
Application of relativistic concepts to the basic fields of physics; space and time, tensors and covariant mechanics of point particles, covariant form of electromagnetism, relativistic variational principles, relativistic quantum equations.

213 **Electromagnetic Theory: Macroscopic Effects** (3) Harper
Detailed consideration of classical electromagnetic field theory in vacuum and in electrically and magnetically active media. Boundary-value problems, multipole expansions, induced polarizations, time-dependent fields, frame dependence of the fields, gauge transformations, radiation fields.

214 **Electromagnetic Theory: Electrodynamics and Radiative Effects** (3) Harper
Analysis of problems involved in obtaining the motion of charges in given electromagnetic fields and radiation from such charges. Covariant methods developed and used where suitable. Specific topics include radiation by moving charges, spectral decomposition and integrated flux, angular distribution of radiation, radiation reaction and anomalies.

221–22 **Quantum Mechanics** (3–3) Prats
General aspects of quantum mechanics with emphasis upon the developmental principles involved. Operators, representations, and transformation theory. Schrodinger and Heisenberg pictures, angular momentum, perturbation theory, scattering theory. (Academic year)

224 **Statistical Mechanics** (3) Peverley
Study of classical and quantum-equilibrium statistical mechanics. Kinetic theory and transport phenomena reviewed prior to examining principles of statistical mechanics. Among topics considered: distribution functions, H theorems, partition functions, Gibb's paradox, canonical ensemble, grand canonical ensemble, ideal gases, interacting gases, cluster expansion, virial expansion, and density matrices.

225–26 **Laboratory** (3–3) Hobbs, Briscoe
Individual work on special topics. Laboratory fee, $20 per semester. (Academic year)

231 **Quantum Electrodynamics: Theory and Applications** (3) Lehman
A presentation of the lower-order effects depending upon the quantal nature of the electromagnetic field: Hamiltonian formulation and field quantization, perturbation calculations, Compton effect, photoelectric effect, electron–electron scattering, pair creation and annihilation, indices of refraction, divergence difficulties.

232 **Quantum Field Theory** (3) Bergmann, Lehman
Covariant presentation of general theory of quantized fields. Boson and Fermion fields, theory of S matrix, dispersion relations, and renormalization program.

233 **Nuclear Theory** (3) Prats, Lehman
Nuclear interactions, nuclear models, theory of nuclear reactions, pion physics, and weak interactions.

243 **Solid-State Physics: Structure and Binding** (3) Khatcheressian, Hobbs, Peverley
Atomic structure of solids and analysis of the binding of crystals. Crystalline forms and symmetries, atomic vibrations and specific heats, sound and optical propagation, crystalline defects.

244 **Solid-State Physics: Electronic Processes in Metals** (3) Khatcheressian
Phenomena in metals and semiconductors determined by the electronic states allowed: binding, specific heats, magnetic properties, transport phenomena. Independent particle approximation and many-body aspects are discussed.

250 **Selected Topics in Modern Physics** (3) Staff
Possible topics include nuclear three-body problem; group theory and symmetry principles in physics; differential manifolds applied to physics; elec-

tric states and superconductivity; gauge field theories; dispersion relations and unitarity in scattering theory. May be repeated for credit with permission of graduate advisor. (Fall and spring) Staff

291 **Seminar** (1)
Lectures on special problems in physics. May be repeated once for credit (Fall and spring) Staff

299–300 **Thesis Research** (3–3)
(Fall and spring)

**Fourth Group** Staff

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated once for credit. (Fall and spring) Staff

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit (Fall and spring)

## PHYSIOLOGY—GRADUATE PROGRAMS

Professors R.A. Kenney *(Chair)*, M.E. Tidball, M.M. Cassidy, M.J. Jackson, J.J. Bernstein *(Research)*
Associate Professors R.A. Lavine, D.W. Watkins, J.K. Kelleher *(Research)*

*Master of Science in the field of physiology*—Prerequisite: a bachelor's degree. No major is specified, but the undergraduate program must have included the following courses or their equivalents: BiSc 11–12; Chem 11–12, 22, 151–52, 153–54; Math 31; Phys 1, 2.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The 30 hours of required work include Phyl 201, 205, 212, 221, and 298, in addition to the thesis.

*Doctor of Philosophy in the field of physiology*—Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study includes a major field in physiology, a subfield (see below) in physiology, and a supporting field outside of physiology leading to the Cumulative Examination. The 48 semester hours of required course work leading to the Cumulative Examination includes Phyl 201, 205, 212, 221, 298, 396, 397.

*Research fields and areas of study*: applied physiology, cardiovascular physiology, cellular physiology, endocrine physiology, gastrointestinal physiology, neurophysiology, renal physiology, and respiratory physiology.

**Departmental prerequisite**: Phyl 201 or equivalent is prerequisite to all courses in physiology numbered above 201, except Phyl 205, 221, and 212.

**Second Group** Kenney

191 **Selected Topics in Human Structure and Function** (3)
Structural and functional basis of physiology. Required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on completion of additional work as prescribed by the instructor. Open to Prerequisite: BiSc 11–12 or equivalent and consent of instructor. Open to Columbian College students with the approval of the major advisor (Fall)

**Third Group** Staff

201 **Physiology** (8)
Cellular, organ system, and applied mammalian physiology. Prerequisite for graduate students: Anat 201 or Phyl 191, or equivalent; Bioc 221 or Phyl 205, or consent of chairman of department. Concurrent registration in Phyl 212 is required. Open to Consortium students only with permission of chairman of department. (Spring)

205 **Cell Biophysics** (2) Staff
Lecture (2 hours). An introductory survey of the mechanisms for interconversion and utilization of energy in animal cells. A required course for graduate students intending to take Phyl 201. Prerequisite: BiSc 11–12 or equivalent, and consent of instructor. Open to students in the Columbian College of Arts and Sciences with the approval of the student's major advisor. (Fall)

212 **Neurobiology** (3) Staff
Same as Anat 212. An integrated survey of the structure and function of the human nervous system; lecture, clinical demonstrations, and laboratory. Laboratory fee, $25. (Spring)

221 **Seminar** (1) Cassidy
Staff and student presentations from literature. Present work discussed, experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

253 **Physiology of Fluid Balance and Hydrogen Ion Regulation** (2) Cassidy
Discussion of principles of fluid and acid-base balance and their applications. (Fall)

262 **Topics in Cardiovascular Physiology** (2) Kenney
Survey, at an advanced level, of aspects of cardiovascular physiology, especially as interrelated with the respiratory and renal systems. (Fall)

269 **Topics in Neurophysiology and Psychophysiology** (2) Lavine
Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior, and sensory processing. Open to students in the School of Engineering and Applied Science with permission of instructor. (Fall)

295 **Research** (arr.) Staff
By special arrangement with individual staff members. Approximately four hours per week in the laboratory for each semester hour of credit. May be repeated for credit. (Fall and spring)

298 **Comprehensive Physiology** (5) Staff
Guided review of selected areas of physiology appropriate to the student's graduate program. Prerequisite or concurrent registration: Phyl 221. (Fall)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

**Fourth Group**

396 **Advanced Reading and Research** (2) Staff
Limited to students preparing for the Doctor of Philosophy general examination. Tutorial literature survey of a subfield of physiology and of pertinent areas of the candidate's supporting field. This course satisfies the requirement for Part II of the Cumulative General examination in Physiology. (Fall and spring)

397 **Development of Dissertation Problem** (2) Staff
Limited to students preparing for the Doctor of Philosophy general examination. Preparation for written and oral presentation of dissertation problems. This course satisfies the requirement for Part III of the Cumulative General Examination in Physiology. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## POLISH

See **Slavic Languages and Literatures.**

## POLITICAL COMMUNICATIONS

**Committee on Political Communications**
P. Robbins (*Chair*), W.C. Adams, R.S. French, S.G. Larson, J. Manheim, J.A. Morgan, W.M. Reynolds, J.R. Thiel

Columbian College of Arts and Sciences offers an interdepartmental program in political communications leading to the degree of Bachelor of Arts. The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences
2. Prerequisite courses: one course chosen from Stat 51, 53, 91, 183 (Stat 53 is usually preferred); PSc 1, 2; Econ 1 or 2; Comm 1, 55; Jour 72.
3. Required courses in the major:
   (a) PSc 101, 120; two courses chosen from PSc 104, 111, 112, 114, 115, 116, 117, 118, 119, 122, 124, and Hist 134.
   (b) Jour 111; two courses chosen from Jour 133, 137, 138, 139, 145, 146, 150, 151.
   (c) Comm 49 or 143; Comm 134; one course chosen from Comm 112, 121, 126; one course chosen from Comm 133, 145, 180, 181, 185, 189.
   (d) PSc/Jour 128, PSc/Jour/Comm 129, Jour 198, PCm 199.

The following electives are strongly recommended: Econ 1 or 2 (whichever is not taken as a prerequisite), Jour 71, PCm 191–92.

Special Honors—Seniors with a grade-point average of at least 3.4 for all course work done at this institution and no grade lower than B in the required courses for the major may declare for Special Honors at the start of the Senior Seminar. The research paper submitted for the seminar must be approved by an honors committee and the grade standards stated above maintained through graduation.

**191–92 Field Experience (3–3)**
Open to juniors and seniors majoring in political communications. Students will spend at least 16 hours a week during the semester in an approved agency or office performing practical work in the subject under the general guidance of a faculty advisor.

**199 Senior Seminar in Political Communications (3)**
Limited to majors in political communications. Selected reading and discussion with possible field work in the professional subject.

## POLITICAL SCIENCE

*Professors* H.L. LeBlanc (*Chair*), B. Nimer, H.C. Hinton, B.M. Sapin, J.A. Morgan, Jr., F. Reich, Y.C. Kim, S.J. Wayne, J.M. Logsdon, W.H. Lewis, C.A. Linden, H.R. Nau, M.A. East

*Associate Professors* C.F. Elliott, C. McClintock, J.R. Henig, M.J. Sodaro, S.L. Wolchik, R.W. Rycroft, C.J. Deering, C.C. Joyner, H.B. Feigenbaum

*Assistant Professors* D.A. Bositis, J.H. Lebovic, R.P. Stoker, J.P. Rogers, V. Coleman, S.C. Larson, N.J. Brown

*Adjunct Assistant Professor* R. Hollis

*Bachelor of Arts with a major in political science (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite: PSc 1 and 2 (or the equivalent). Six courses in the social sciences other than political science, to include 6 hours of history or 6 hours of economics. Two to four semester hours of introductory foreign language and statistics are strongly recommended.
3. Required courses in the major: 30 semester hours of second-group political science courses, including a distribution requirement that consists of 6 semester hours from each of the following groups: Group A (political theory and methodology)—PSc 101, 102, 104, 105, 106, 107, 108, 110; Group B (American government and politics)—PSc 111, 112, 114, 115, 116, 117, 118, 119, 120, 122, 124, 129; Group C (comparative government and politics)—PSc 130, 131, 146, 168, 170, 173, 177, 179, 180, 181, 183. Group D (international politics, law, and organizations)—PSc 140, 142, 144, 149, 161, 175, 176, 178, 182, 184, 185,

Of the courses in Group A at least one must be PSc 101, 102, or 104, and it is recommended that this course be taken as early in the student's academic program as possible.

Every major must complete a proseminar or, if eligible, an Honors Seminar (PSc 196, 197, 198, or 199) in the junior or senior year. A maximum of two of these may be included in a student's program; such courses do not satisfy the department's group distribution requirements. A 200-level course may be substituted for the proseminar requirement with the written permission of the instructor and the undergraduate coordinator.

The department also offers a major with a public policy focus. Students who wish to concentrate in public policy must distribute their 30 hours in political science as follows: 3 semester hours from each of Groups A, B, C, D; PSc 104; 9 semester hours in policy-oriented courses to be selected from a group designated by the program advisor; and one policy-oriented proseminar.

Up to 12 hours of either service-learning or internship credit may be applied toward a degree. No more than 3 hours of such courses may be credited toward the major; these courses do not satisfy the distribution requirement.

Students in the 90-semester-hour degree program must receive grades of *A* in at least 18 semester hours of second-group political science courses.

Students may apply for graduation with Special Honors. To qualify, the student must fulfill the general requirements stated under Regulations and take at least one political science honors seminar in which an independent study project is completed with distinction. The student must complete the seminar before the final semester of course work. The project is evaluated by a Departmental Honors Committee, which can recommend graduation with Special Honors in political science. To be eligible for enrollment in an honors seminar, students must be political science majors, have successfully completed PSc 101, have achieved a quality-point index in the major of at least 3.3, and be juniors or seniors.

*Minor in political science*—Required: PSc 1 and 2 (or the equivalent) plus 15 semester hours of second-group political science courses, including a distribution requirement of one course from each of the four groups listed in item 3 above. A minimum of 9 semester hours of other social science courses is also required.

*Master of Arts in the field of political science*—Prerequisite: a bachelor's degree with a major in political science from an accredited college or university, or an equivalent degree, and high undergraduate scholastic standing.

Required: The general requirements stated under the Graduate School of Arts and Sciences and either (1) a reading knowledge of a modern foreign language or a specified level of knowledge in statistics, or (2) two graduate-level courses in a cognate discipline. Students may elect one of the following programs: (1) 24 semester hours of graduate course work, plus a thesis (equivalent to 6 semester hours), and the satisfactory completion of a Master's Comprehensive Examination in three subfields selected from those listed under the Ph.D. program; or (2) 33 semester hours of graduate course work without a thesis and the satisfactory completion of a Master's Comprehensive Examination in four subfields selected from those listed under the Ph.D. program.

All students must take one course chosen from PSc 200, 230, or 240 during the first semester of graduate study. The course selected must have the approval of the coordinator of graduate studies.

*Doctor of Philosophy in the field of political science*—Students of outstanding ability are admitted to the doctoral program upon recommendation of a departmental graduate committee and the concurrence of the dean of the Graduate School of Arts and Sciences.

Required: The general requirements stated under the Graduate School of Arts and Sciences. Each student must complete a General Examination, which covers a major and minor field of study.

PSc 200 and 201 are required of all students unless they demonstrate knowledge of the courses' subject matter by passing a waiver examination.

Each student must choose a major and minor field of study from five principal subject-matter divisions. Each subject-matter division has several subfields of study from which the student, in consultation with an advisor, constructs a program. A major field of study consists of three subfields; a minor field of study consists of two subfields.

The subject-matter divisions and their subfields are (1) theory and methodology (analysis of Western political thought, analysis of Marxist and Marxist–Leninist thought, and scope and methods of political science); (2) comparative and foreign politics (comparative political analysis, comparative communist systems, regional comparative politics, and domestic politics of a specified major political system); (3) international relations (international politics, international law, international organization, regional international relations, and foreign relations of a specified major political system); (4) American politics (American political process, national policy-making process, American constitutional law and judicial process, and state, local, and urban politics); and (5) public policy (methods of public policy analysis, science policy, domestic policy analysis, and national security policy). Quantitative political analysis may be used as a subfield in any of the subject-matter divisions.

**Departmental prerequisite:** PSc 1 and 2 (or the equivalent) are prerequisite to all second-group courses in political science.

**First Group**

1 **Introduction to Comparative and International Politics** (3) Sodaro, Joyner, Feigenbaum, Rogers, Brown
Comparative and international political systems; emphasis on structures and processes of major foreign governments and the force of basic ideologies. (Fall and spring)

2 **Introduction to American Politics and Government** (3) Wayne, Rycroft, Bositis, Coleman, Larson
Structure, powers, and processes of the American political system and their impact on public policy. (Fall and spring)

3–4 **Introduction to Political Behavior** (6–6) Holly
Role of personal and social values in political behavior. Fall: Focus on problems in the American liberal tradition. Spring: A comparative perspective on democratic and authoritarian governments in the 20th century. Admission by special selection process. (Academic year)

50 **Washington, D.C.: History, Culture, and Politics** (3) Gillette and Interdisciplinary Team
Same as AmCv/Hist/U&RP 50.

**Second Group**

101 **Scope and Methods of Political Science** (3) Kim, Lebovic, Stokke
Nature of political inquiry, approaches to the study of politics and government, empirical methods of research. (Fall and spring)

102 **Empirical Political Analysis** (3)
Extensive examination of empirical research methods in the analysis of political behavior. Research design, data collection (survey and aggregate), and data analysis. Prerequisite: PSc 101 or permission of instructor. (Spring)

104 **Methods of Public Policy Analysis** (3) Heng, Stokke
Introductory overview of the concepts, issues, and techniques of systematic policy analysis and its role in the policy process. (Fall and spring)

105 **Political Theory: Major Issues of Western Political Thought I** (3) Lindenberg
Foundations of Western political thought. Plato to Aquinas. (Fall)

106 **Political Theory: Major Issues of Western Political Thought II** (3) Lindenberg
Theoretical roots of modern political order and disorder. Machiavelli to Rousseau. (Spring)

107 **Issues in Modern Political Thought** (3) Linden, Warner
Issues of modern political thought as seen through major representative thinkers. Emphasis on conservative, liberal, and radical thought. (Fall and spring)

108 **Marxism–Leninism** (3) Ehrlich
Intensive study of theories and philosophical assumptions of modern communism. Emphasis on Marx, Engels, and Lenin, and consideration of Bernstein, Rosa Luxemburg, Lukacs, Trotsky, and Stalin. (Spring)

110 **American Political Thought** (3) Morgan
Political thought in the U.S. from colonial times to the present as seen through major representative writings. (Spring)

111 **State and Urban Politics** (3) Henig
Comparative analysis of context, institutions, processes, and policies of state and urban political systems. (Fall)

112 **State and Urban Policy Problems** (3) Henig
Selected issues in state and urban policy-making, with emphasis on urban and metropolitan settings. (Spring)

114 **U.S. Constitutional Law and Politics I** (3) Morgan
Separation of powers, federal–state relationships, economic regulation. (Fall)

115 **U.S. Constitutional Law and Politics II** (3) Morgan
Political and civil rights. (Spring)

116 **The American Presidency** (3) Wayne
Examination of the politics of presidential selection, the authority of the contemporary institution, the mechanisms and processes for formulating public policy, and the influences of personality on performance in office. (Fall and spring)

117 **Public Administration and Bureaucratic Politics** (3) Rycroft
Basic concepts in public administration; influence of bureaucratic politics on policy formulation and implementation. (Fall)

118 **Legislative Process** (3) Deering
Theory, structure, and process of the U.S. Congress, with emphasis on elections, party organization, committees, and floor procedure, in the context of executive–legislative relations and interest-group activities. (Fall and spring)

119 **U.S. Political Parties and Politics** (3) LeBlanc
Role of parties as a linkage between mass preferences and government policies. Organization, nominations, voting, and activities in legislative and executive branches. (Fall and spring)

120 **Public Opinion and Political Socialization** (3) Staff
Sources of mass political attitudes and behavior; voting and political campaigning. (Fall)

122 **Science, Technology, and Politics** (3) Logsdon, Rycroft
Multiple impacts of scientific and technological developments on the political systems. Discussion of public policies for support, use, and control of science and technology. (Fall and spring)

124 **Issues in Domestic Public Policy** (3) Deering, Stoker, Coleman
Examination of the decision-making process and the substance of various issues in domestic public policy in such areas as crime, economics, education, energy, the environment, poverty, and health. (Fall and spring)

128 **Governmental Processes and the News Media** (3) Staff
Same as Jour 128.

129 **TV News: The Politics of Visibility** (3) Lichter, Larson
Examination of the impact of television on American politics and society, the nature of coverage of political issues and campaigns, the dynamics of selecting and presenting news stories. Same as JourComm 129. (Fall and spring)

130 **Comparative Government and Politics I** (3) Feigenbaum, McClintock
Comparative political analysis with primary focus on the principal states of Western Europe. (Fall and spring)

131 **Comparative Government and Politics II** (3) Sodaro, Wolchik
Government and politics of the communist nations, emphasis on the Soviet Union and countries of Eastern Europe. (Fall and spring)

140 **International Politics** (3) Nau, Sodaro, Joyner, Lebovic, Brown
International actors, international and domestic environments of foreign policy, global and regional patterns, general characteristics of foreign policy. (Fall and spring)

142 **International Organizations** (3) Nau, Stambuk
Development and operations of the United Nations, regional organizations, and functional international organizations. (Fall and spring)

144 **Public International Law** (3) Jovner
Survey of international law, with emphasis upon law's conceptual development and practical application to contemporary international issues. (Fall and spring)

146 **U.S. Foreign Policy** (3) Sapin, Rogers
Constitutional, political, and international factors that determine the formulation, execution, and substance of U.S. foreign policy. (Fall and spring)

149 **Military Force and Foreign Policy** (3) Sapin, Lewis
Impact of military considerations on U.S. foreign policy; major problems in national security, e.g., strategic weaponry, military assistance, regional security problems. (Fall and spring)

161 **European–Atlantic Relations** (3) Stambuk
International politics of the North Atlantic area, the European Common Market, and U.S.–European relations. (Fall)

168 **Soviet Foreign Policy** (3) Elliott
Relations with U.S., Europe, Third World, China; international communism; instruments of foreign policy; interrelationships between domestic and foreign policies; ideology and foreign policy. (Fall)

170 **Governments and Politics of Northeast Asia** (3) Hinton
Political institutions and processes of China (including Taiwan), Japan, and Korea since World War II. Influence of indigenous traditions and foreign contacts. (Fall, even years)

173 **Governments and Politics of South and Southeast Asia** (3) Hinton
Interaction of traditional, colonial, and contemporary influences in the domestic and international politics of the Indian subcontinent and of mainland and insular southeast Asia. (Fall, odd years)

175 **International Relations of East Asia** (3) Kim
Analysis of the foreign policies of selected East Asian countries and the foreign policies of major powers toward the region. (Fall) Reis

176 **The Arab–Israeli Conflict** (3) (Spring and summer)
Origins, evolution, and issues of the Arab–Israeli conflict.

177 **Governments and Politics of the Middle East** (3) Reich, Brown
Politics of the eastern Arab states, Turkey, Iran, and Israel. (Fall)

178 **International Relations of the Middle East** (3) Reich, Brown
Analysis of the regional and international relations of the Middle East. (Spring) Reich

179 **Israeli Politics and Foreign Policy** (3) Lewis
Examination of the institutions, processes, and issues of Israeli politics and foreign policy. (Fall)

180 **Governments and Politics of North Africa** (3) Nimni
Domestic and international politics of Algeria, Tunisia, Morocco, Libya, Egypt, Sudan, their relations with states of the Middle East. (Spring)

181 **Politics of Middle and Southern Africa** (3) Nimni
Comparative analysis of political systems in selected countries of non-Mediterranean Africa. (Fall)

182 **African International Politics** (3)
Analysis of interstate relations in Africa and of selected aspects of African relations with the outside world. Recommended prerequisite: PSc 181 or equivalent. (Spring)

183 **Governments and Politics of Latin America** (3) McClintock
Political processes and institutions of selected countries in South America, Central America, and the Caribbean. Emphasis on the possibilities for democracy and revolution. (Fall)

184 **International Relations of Latin America** (3) McClintock
U.S.–Latin American relations and foreign policies of selected states. (Spring)

186 **U.S. Policies Toward Sub-Saharan Africa** (3) Nimer
Analysis and evaluation of contemporary U.S. policies and policy-making toward selected areas and individual countries of sub-Saharan Africa: the Horn, East Africa, western Indian Ocean states, southern Africa, Zaire, Nigeria, and Ivory Coast. (Summer)

187 **Internship: Political Behavior** (3) LeBlanc
Study of political behavior through internship experience with Congress, executive departments or agencies, politically active private-sector groups, political parties, or electoral campaigns. Admission requires departmental approval. (Fall and spring)

188 **Internship: Urban Affairs** (3 or 6) Henig
Study of urban political and policy-making processes through assignment to an urban-related political or governmental office. Primarily for senior urban affairs majors. Admission requires departmental approval. (Fall and spring)

190 **Selected Topics in Political Science** (3) Staff
(Fall and spring)

191 **Internship: International Affairs** (3 to 9) Nau
Faculty-supervised internships in the Department of State, Organization of American States, and other international affairs agencies. Admission by approval of instructor. (Fall and spring)

192 **Proseminar: Political Science** (3) Staff
Examination of selected problems in political science. Admission requires departmental approval. (Fall and spring)

193 **Proseminar: Urban Affairs** (3 or 6) Henig
Readings, research, and class discussion on selected topics in urban politics and policy-making. Primarily for senior urban affairs majors. Admission requires departmental approval. (Fall and spring)

196 **Honors Seminar: Political Theory** (3) Staff
Research on selected topics. Prerequisite: PSc 101. Admission requires departmental approval.

197 **Honors Seminar: American Government and Politics** (3) Staff
Research on selected topics. Admission requires departmental approval. Prerequisite: PSc 101.

198 **Honors Seminar: Comparative Government and Politics** (3) Staff
Research on selected topics. Admission requires departmental approval. Prerequisite: PSc 101.

199 **Honors Seminar: International Politics** (3) Staff
Research on selected topics. Admission requires departmental approval. Prerequisite: PSc 101.

**Third Group**

200 **Introduction to Political Analysis** (3) Staff
Alternative approaches to political analysis, construction of research designs, and problems of measurement. (Fall and spring)

201 **Empirical Political Analysis** (3) Staff
Techniques of social science data analysis, with emphasis on statistics and computer applications. PSc 200 or other previous introductory research training is highly desirable. (Spring)

202 **Advanced Topics in Empirical Political Analysis** (3) Staff
Advanced techniques of data collection and analysis, varying emphasis on such methods as causal modeling, analysis of variance, regression analysis, and simulation. (Offered as the demand warrants)

203 **Approaches to Public Policy Analysis** (3) Stoker
Empirical and normative foundations of systematic policy analysis: concepts,

theories, models, issues, strengths, limitations, and uses and misuses in the policy process. (Fall) Stoker

204 **Methods of Public Policy Analysis** (3)
Quantitative and qualitative techniques of systematic policy analysis, such as forecasting, cost–benefit analysis, simulation, operations research, social indicators, and quasi-experimental methods. Prerequisite: PSc 203 or equivalent. (Spring) Linden

205 **Readings in Political Theory** (3)
Selected major works, both ancient and modern, that illuminate basic problems and questions of political theory. (Fall) Linden

206 **Topics in Political Theory** (3)
Advanced readings and group discussions. Analysis and interpretation of selected concepts and schools of thought. (Spring) Elliott, Linden, Wolchik

207 **Readings in Socialism and Communism** (3)
Readings and discussions of works illuminating the development of pre- and post-Marxian socialist thought. (Fall) Elliott, Linden

208 **Readings in Marxism–Leninism** (3)
Readings and discussions in Marxism–Leninism and its controversies from Lenin to the present. (Spring) Deering

210 **American Political Process** (3)
A survey of American political institutions, processes, and behavior. (Fall, even years) Henig

211 **State and Urban Politics** (3)
Comparative analysis of the context, institutions, processes, and policies of state and urban political systems. (Fall) Henig

212 **State and Urban Policy Problems** (3)
Analysis of public policy issues confronting state and urban governments; emphasis on the theoretical roots and empirical impact of past and present programs in such areas as housing, education, poverty, and crime. (Spring) Morgan

214 **Topics in Constitutional Law** (3)
Lectures and group discussions on constitutional law and politics. Morgan

215 **Judicial Policy-Making** (3)
Role of the judiciary in policy formulation; emphasis on the U.S. Supreme Court and civil liberties issues. Wayne

216 **American Presidency** (3)
Personalized and institutionalized aspects of the presidency with particular emphasis on the politics of contemporary policy-making. (Spring) Rycroft

217 **Bureaucratic Politics** (3)
Structure and operation of governmental bureaucracy with particular emphasis on the politics of formulating and implementing public policy. (Spring) Deering

218 **Legislative Politics** (3)
Theory, structure, and process of the U.S. Congress, with emphasis on member–constituency relations, individual and collective decision making, party and committee activities, executive–legislative relations, and interest-group activities. (Fall, odd years) LeBlanc

219 **American Political Parties and Elections** (3)
Nature and functions of American political parties: organizational status, nominating and electoral politics, and role in governing. Staff

220 **Public Opinion and Political Socialization** (3)
Sources and dynamics of public opinion and political socialization. (Spring) Deering, Coleman

221 **Interest-Group Politics** (3)
Theory, structure, and activities of interest groups in American politics. Logsdon, Rycroft

222 **Science, Technology, and Public Affairs** (3)
Introduction to the study of science, technology, and public policy; focus on policy issues that arise from interactions between scientific and technological developments and government activity. (Fall) Logsdon, Rycroft, Nie

223 **Science, Technology, and Public Policy** (3)
Research and intensive analysis of selected policy issues with significant scientific or technological aspects. Prerequisite: PSc 222, 252. (Spring)

224 **Domestic Policy Analysis—Selected Topics** (3) Coleman
Analysis of U.S. policy toward selected domestic problems.

225 **Budgetary Policy** (3) Staff
Analysis of selected topics in U.S. monetary and fiscal policy. Offered off campus only.

226 **Budgetary Politics** (3) Staff
Examination of economic policy-making in the United States, with emphasis on major participants and the budget process. Offered off campus only.

227 **Electoral Laws and Financial Practices** (3) Staff
State statutes; registration and filing procedures; federal campaign finance legislation, compliance procedures, and enforcement.

228 **Media and Politics** (3) Larson
Role of the media in American politics, with emphasis on television news coverage, political debates, political advertising, and their impact on the electorate.

230 **Comparative Government and Politics I** (3) Kim, McClintock, Feigenbaum
Examination of basic approaches to comparative politics. (Fall)

231 **Comparative Government and Politics II** (3) Kim, McClintock, Feigenbaum
Comprehensive examination of specific issue areas in comparative political analysis. (Spring)

232 **Comparative Communist Systems I** (3) Wolchik
Comparative analysis of the political history and contemporary political processes of communist states, with emphasis on the Soviet Union and Eastern Europe. Same as Hist 232. (Fall)

233 **Comparative Communist Systems II** (3) Wolchik
Comparative analysis of the political history and contemporary political processes of communist states, with emphasis on China and Cuba, and non-ruling communist parties. Same as Hist 233. (Spring)

234 **Comparative Legislative Systems** (3) Staff
Selected problems of legislative theory and behavior from a comparative perspective, with particular reference to the parliamentary systems of West Germany, France, and Britain. Offered off campus only.

238 **U.S. Foreign Economic Policy** (3) Nau
Exploration of ideas and issues involved in U.S. foreign economic policy, including relationship of economic and security issues, interdependence, protectionism, role of the dollar, industrial policy, and the debt crisis. (Fall)

239 **U.S. Foreign Economic Policy-Making** (3) Nau
Research seminar focusing on domestic interests and the policy process in U.S. foreign economic policy-making, including business, labor, and public interest groups, the interagency process, and the role of the President. (Spring)

240 **Theories of International Politics I** (3) Nimer, Lebovic, East
Critical examination of contemporary theories, both empirical and normative, with emphasis on actor theory. (Fall)

241 **Theories of International Politics II** (3) Nimer, Lebovic, East
Critical examination of contemporary theories, both empirical and normative, with emphasis on interaction theory. (Spring)

242 **Problems in International Organizations I** (3) Nau, Stambuk
Collective security, law, and the politics of international organizations. (Fall)

243 **Problems in International Organizations II** (3) Nau, Stambuk
Social and economic interdependence and the politics of international organizations. (Spring)

244 **International Law I** (3) Joyner
The sources and development of international law, with special attention given to current trends and future problems. (Fall)

245 **International Law II** (3) Joyner
Critical examination of selected contemporary problems of world order, e.g., legal issues involving global resource regimes, economic development, and human rights. (Spring)

246 **U.S. Foreign Policy-Making** (3) Sapin, Rogers
Patterns and problems in contemporary U.S. foreign policy-making. Attention to domestic political factors as well as relevant institutions and agencies (Fall)

247 **U.S. Foreign Policy** (3) Sapin, Rogers
The substance of contemporary U.S. foreign policy: major problems, concepts, and lines of development since World War II. (Spring)

248 **U.S. National Security Policy-Making** (3) Sapin, Lewis, Rogers
Executive organization and processes for national security policy-making. Attention to relevant theoretical approaches. (Fall)

249 **U.S. National Security Policy** (3) Sapin, Lewis, Rogers
Fundamental considerations; selected issues, e.g., arms control and disarmament, regional security problems, military assistance. (Spring)

250 **Foreign Policy Analysis—Selected Topics** (3) Staff
Analysis of U.S. foreign policy toward selected world regions.

252 **Science, Technology, and International Affairs** (3) Nau
Exploration of implications of technological change for international politics and influence of foreign policy interests on international technological development. (Spring)

253 **Defense Policy and Program Analysis I** (3) Kugler
Analysis of U.S. defense budget, force posture, and program priorities. Methodology for defense planning and program evaluation. Special attention to strategic nuclear forces. (Fall)

254 **Defense Policy and Program Analysis II** (3) Kugler
Analytical methodology for defense policy and program choices. Special attention to U.S. general purpose forces, including forces for NATO/Europe. (Spring)

255–56 **Applied Quantitative Techniques** (3–3) Kugler
The application of quantitative techniques in the solution of issues in defense policy. (Academic year)

257 **Arms Control and Disarmament** (3) Staff
Major issues and trends in the postwar development of U.S. arms control and disarmament policy. (Spring)

258 **Communist Party of the Soviet Union** (3) Sodaro
Analysis of the internal evolution of the Communist Party and and its role in the Soviet system from its origins to the present day. Same as Hist 258. (Spring)

260 **Western European Politics** (3) Feigenbaum
Examination of the principal characteristics of the British, French, West German, and Italian political systems, comparing their institutional and behavioral adaptations to the problems of advanced industrial democracies. (Fall)

261 **Politics of the European Community** (3) Stambuk
Problems in Western European politics, with emphasis on supranational political processes and selected policy outcomes in the context of the European Common Market. (Spring)

262 **The Political Economy of Western Europe** (3) Feigenbaum
An examination of the relationships between economic interests and politics as they affect the societies of Western Europe. Selected issues of public policy are discussed. (Spring)

263 **The Soviet Union and Europe** (3) Sodaro
Soviet foreign policy toward Western and Eastern Europe, including its economic and military dimensions. (Fall)

264 **Governments and Politics of Eastern Europe** (3) Wolchik
Comparative analysis of domestic political processes and policies in Eastern Europe. (Fall)

265 **The International Politics of Eastern Europe** (3) Wolchik
Major historical, political, social, and regional factors that have shaped the interwar, World War II, and postwar evolution of Eastern Europe; emphasis

on foreign relations with outside powers and on regional East–West contacts. (Spring)

266 **Readings in Soviet Government and Politics** (3) Elliott, Linden
Readings in contemporary Soviet domestic government and politics. (Fall)

267 **Soviet Government and Politics** (3) Elliott, Linden, Wolchik
Research seminar in selected problems of Soviet domestic government and politics. Emphasis: since Stalin. Prerequisite: PSc 266 or permission of instructor. (Spring)

268 **Soviet Foreign Policy** (3) Elliott
External problems and policies of the U.S.S.R., with emphasis on the period since Khrushchev. Relations with communist states, Western powers, Third World countries, and nonruling communist parties. (Spring)

269 **Soviet Military Policy and Strategy** (3) Elliott
Developments in Soviet military policy and strategy. Emphasis on party–military relations, the decision-making process, manpower problems, structure of the Soviet armed forces, and the external role of the Soviet military. (Fall and spring)

270 **Politics of the People's Republic of China I** (3) Hinton
Introduction to the substance of and literature on contemporary Chinese politics. Discussion and reading. (Fall)

271 **Politics of the People's Republic of China II** (3) Hinton
Research seminar. Introduction to the analysis of official Chinese documents and other primary materials. Presentation of student papers. Prerequisite: PSc 270 or equivalent. (Spring, even years)

272 **Foreign Policy of the People's Republic of China** (3) Hinton
Objectives; formulation and implementation; the People's Republic of China as Asian state, revolutionary influence, would-be great power. (Spring)

275 **International Politics of East Asia** (3) Hinton
Foreign policies and international behavior of the regional states (especially China, Japan, and Vietnam) and the extraregional powers (especially the U.S. and the U.S.S.R.). (Spring, odd years)

276 **Governments and Politics of Japan and Korea** (3) Kim
Readings and research on the domestic and foreign policies of Japan and North and South Korea. (Fall or spring)

277 **Governments and Politics of the Middle East** (3) Reich, Brown
Readings and research on selected problems of the governments and politics of the Middle East. (Fall)

278 **International Relations of the Middle East** (3) Reich, Brown
Readings and research on the regional and international relations of the Middle East. (Spring)

279 **The Powers in the Middle East** (3) Reich
The role of the powers in the Middle East, with emphasis on the policies of the United States and the Soviet Union. Consideration is given to other major European and Asian powers.

280 **Governments and Politics of North Africa** (3) Reich, Lewis
Readings and research on selected problems in the governments, politics, and international relations of North Africa. (Fall)

281 **Topics in African Politics** (3) Nimer
Readings, research, and discussion of selected aspects of African domestic and international politics. (Fall)

283 **Governments and Politics of Latin America** (3) McClintock
Readings and discussion on the politics of selected countries in South America, Central America, and the Caribbean. Emphasis on the possibilities for democracy and revolution. (Fall)

284 **International Relations of Latin America** (3) McClintock
Readings and discussion on U.S.–Latin American relations and the foreign policies of selected states. (Spring)

286 **Selected Topics in American Politics** (3) Staff
Readings and discussion. (Fall or spring)

287 **Selected Topics in Political Theory** (3) Staff
Readings and discussion. (Fall or spring)

288 **Selected Topics in Comparative Politics** (3) Staff
Readings and discussion. (Fall or spring)

289 **Selected Topics in International Politics** (3) Staff
Readings and discussion. (Fall or spring)

290 **Colloquium: National Defense Policies and Issues** (3) Lewis
Interuniversity colloquium for advanced students of security policy studies. Admission by permission of the instructor. (Spring)

291 **Colloquium: East Asia** (3) Hinton
Interuniversity colloquium for advanced students of East Asian affairs. Admission by permission of the instructor. (Fall and spring)

292 **Colloquium: The Soviet Union and Eastern Europe** (3) Staff
Interuniversity colloquium for advanced students of Russian and Eastern European affairs. Admission by permission of the instructor. (Fall and spring)

297 **Reading** (3) Staff
Limited to master's degree candidates. Written permission of instructor required. (Fall and spring)

298 **Research** (3) Staff
Limited to master's degree candidates. Written permission of instructor required. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

**Fourth Group**

301 **Advanced Reading and Research in Political Theory** (3) Staff
310 **Advanced Reading and Research in American Politics** (3) Staff
340 **Advanced Reading and Research in Comparative Politics** (3) Staff
350 **Advanced Reading and Research in International Politics** (3) Staff

397 **Advanced Reading** (3) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

398 **Advanced Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## PORTUGUESE

See **Romance Languages and Literatures.**

## PSYCHOLOGY

*Professors* J.N. Mosél, R.D. Walk, A.D. Kirsch, V. Kirkbride *(Emeritus)*, C.E. Rice, I. Abravanel, D.E. Silber, J. Miller, C.J. Lange, A.J. Caron *(Research)*, L.A. Rothblat, R.J. Caron *(Research)*, R.A. Peterson, J. Zeidner *(Research)*, H. Weingartner *(Chair)*
*Professorial Lecturer* R.K. Kahn
*Associate Professors* S.A. Karp, R.W. Holmstrom, P.J. Poppen, L. Brandt, S. Hashtroudi, L.R. Offermann
*Associate Professorial Lecturers* R.W. Swezey, J.C. Sharf
*Assistant Professors* C.A. Rohrbeck, R.B. Hays *(Visiting)*
*Adjunct Assistant Professor* D.M. Cooper

**Clinical Training Staff**

*Clinical Professors* J. Borriello, J.W. Cummings, D.E. Holmes, R.B. Kurz
*Associate Clinical Professors* E. Blum, D.A. Jensen, M.E. Zedek, E.J. Jordan

*Assistant Clinical Professors* H. Bruml, D.M. DePalma, C.S. Detchon, M. Harris, P.L. Ellman, M.D. Jasnow, M.J. Kearney, K.R. Miller, L.E. Moldauer, C.E. Parks, G.M. Royalty, W.L. Scarpetti

*Bachelor of Arts with a major in psychology (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—7 or 8 semester hours selected from Psyc 1, 5, and 6.
3. Required courses in related areas:

(a) 3 semester hours selected from Stat 51, 53, or any first-group course in mathematics except Math 3, 6, or 9. (Students expecting to do graduate study in psychology should elect Stat 53.)

(b) 9 semester hours selected from American civilization, anthropology, economics, geography and regional science, history, philosophy (Phil 71, 113, 151 recommended), political science or sociology, of which 6 hours must be from one of the following: anthropology, economics, history, political science, or sociology. If a student takes more than 6 hours in any one department, the excess will be credited to electives.

4. Required courses in the major—27 semester hours in second-group psychology courses, including Psyc 196 and one course from each of the following groups—Group A: Psyc 118, 121, 161; Group B: Psyc 115, 144, 151, 156; Group C: Psyc 101, 129, 131; Group D: Psyc 110, 111, 112, 132.

It is recommended that students contact their academic advisors as soon as possible for assistance in planning their programs of study.

Although there is no foreign language requirement, students contemplating graduate study are reminded that many graduate schools require knowledge of one and sometimes two foreign languages.

To qualify for graduation with Special Honors the student must fulfill the general requirements stated under Regulations, take an honors seminar (Psyc 197) or a 200-level seminar, and complete an independent study project (Psyc 191) with distinction. The grade point average in psychology required for graduation with Special Honors is 3.3.

*Bachelor of Arts/Master of Arts in the field of art therapy*—A five-year program leading to the B.A. in the field of fine arts or psychology and the M.A. in the field of art therapy. See Art Therapy.

Minor in psychology—18 semester hours are required, including Psyc 1 and at least 9 semester hours of second-group psychology courses. Students considering graduate study in psychology are advised to take Psyc 5 or 6, a distribution of courses from categories A, B, C, D above, Psyc 196, and an elementary course in statistics.

*Master of Arts in the field of psychology*—Prerequisite: the degree of Bachelor of Arts with a major in psychology at this University, or an equivalent degree. Admission to the program is limited, preference will be given those who plan to continue toward a Doctor of Philosophy degree.

Required: the general requirements stated under the Graduate School of Arts and Sciences. Of the 24 required semester hours (exclusive of the thesis), a minimum of 18 must be in third-group psychology courses, including Psyc 202 and either 203 or 204; 6 may be in related fields approved by the department. For detailed requirements consult the chairman of the department.

*Doctor of Philosophy in the field of psychology*—Prerequisite: the degree of Bachelor of Arts with a major in psychology. Students admitted from other disciplines will be expected to complete prerequisite undergraduate courses to prepare for graduate study in psychology. Qualifying scores on the Subject Test of the Graduate Record Examination are required for admission.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) Psyc 202, 203–4, and appropriate statistics courses; and (2) the satisfactory completion of a Preliminary Examination and a major Field Examination. Areas of study: clinical, developmental, experimental, industrial and organizational, and applied social psychology.

**Departmental prerequisite:** Psyc 1 or 5 or 6 is prerequisite to all other courses in psychology. The departmental prerequisite may be waived with the permission of the instructor.

Students electing psychology courses in the freshman year should begin with Psyc 1. With permission of the instructor, students may elect Psyc 5–6 in the freshman year.

**First Group**

1 **General Psychology** (3) Staff
Fundamental principles underlying human behavior. (Fall and spring)

5–6 **Principles and Methods of Psychology** (4–4) Walk, Hashtroudi
Lecture (3 hours), laboratory (3 hours). An experimental approach to understanding behavior; individual and class experiments performed. Psyc 5: sensation, perception, and emotions and their relation to adaptive behavior. Psyc 6: memory, human information processing, learning, and motivation. Laboratory fee, $10 per semester. (Academic year)

8 **Psychology of Motivation and Personality** (3) Staff
Introduction to the psychology of personality. Principles of motivation, personality development, social and cultural factors, and assessment and description of personality emphasized. (Fall and spring)

22 **Introduction to Educational Psychology** (3) Kirkbride
The contributions of psychology to education; emphasis on learning. Includes field work. (Spring)

**Second Group**

101 **Abnormal Psychology** (3) Silber, Holmstrom
Causes, diagnosis, treatment, and theories of various types of maladjustments and mental disorders. (Fall and spring)

104 **Ecology and Mental Health** (3) Karp
Examination by field research of the linkages between aspects of the physical environment and mental health. Tutorials, conferences, and student field research projects. (Fall)

105 **The Psychology of Consumer Behavior and Attitudes** (3) Staff
Consumer behavior and attitudes in regard to advertising, buying habits, consumer action groups and social pressures, and mass persuasion. Lectures and field work. (Spring)

108 **Humanistic Psychology** (3) Moss
Critical examination of humanistic psychology. Emphasis on role of consciousness in human behavior. Philosophic foundations, existential, phenomenological, and transpersonal psychology. (Spring)

110 **Perception and Understanding in Children** (3) Abravanel
Concepts and research in the area of developmental psychology; emphasis on the growth and development of thinking, perceiving, and symbolic activity. (Spring)

111 **Psychology of Childhood** (3) Brandt, Rohrbeck
Developmental approach to study of the child. Emphasis on the socialization process, learning, and the child's view of the world

112 **Psychology of Adolescence** (3) Staff
Psychological characteristics and problems peculiar to adolescence with emphasis on application of psychology to solution of such problems.

115 **Psychology of Language and Communication** (3) Moss
Introduction to psycholinguistics and verbal behavior. Information theory, generative grammar theory, cultural and linguistic structures in perception, and neurolinguistics programming. (Fall)

117 **Psychology of Art and Picture Perception** (3) Wa
Principles of perception as applied to art. Theories of Arnheim, Gibson, Gombrich, and Goodman as related to art and picture perception; study of cross-cultural research and research with children.

118 **Neuropsychology** (3) Rothblat
Analysis of neural processes underlying behavior. Basic structure and functions of the nervous system, with emphasis on sensory processes, learning and memory, motivation, and emotion. (Fall and spring)

119 **Group Dynamics** (3) Miller
Relationship of the individual to groups, collectivities, and larger social systems. Theory, research, and applications of group and organizational processes, emphasizing contributions of Freud, Bion, Slater, Miller and Rice. Opportunity is provided to attend a group dynamics workshop, which is recommended but not required. Enrollment limited. (Spring)

121 **Psychology of Learning** (3) Hashtroudi
Theories and issues related to basic learning processes as determinants of behavior. Emphasis on current research using both human and animal subjects. (Fall)

122 **Psychology and Human Relations** (3) Silber
Understanding human relations and T-group techniques by evolving an ongoing T-group within the course itself. For junior and senior undergraduate social science majors; open to others with permission of instructor. (Summer)

129 **Theories of Personality** (3) Karp, Poppen, Rice
Survey of personality theories; emphasis on their application to problems of individuals. (Fall and spring)

130 **Seminar: Political and Social Implications of Current Approaches to Psychological Treatment** (3) Karp
Presentation and discussion of recent work, such as that of Szasz and Goffman, bearing upon the implications for individuals and society of various approaches to psychological treatment, including psychotherapy and behavior modification.

131 **Psychological Tests** (3) Karp
Survey of psychological tests and their more common uses in business, industry, government, law, medicine, and education. Material fee, $10. (Fall and spring)

132 **Socialization in Childhood** (3) Brandt
Examination of primary methods by which the child is shaped in terms of social judgment and self-control; internalization of controls, assimilation of societal values and parenting procedures. Organized by focus on issues according to developmental level.

135 **Freud and Modern Psychoanalysis** (3) Miller
Introduction to the work of Freud and his impact on modern psychoanalysis, focusing on the meaning of dreams and the unconscious function of conflict and defense, infantile sexuality and the Oedipus conflict, development of the ego, theory of anxiety and neurosis, and the death instinct. (Spring)

144 **Industrial/Organizational Psychology** (3) Offermann
Psychological concepts and methods applied to problems of personnel management, employee motivation and productivity, supervisory leadership, and organizational development. (Fall and spring)

150 **Psychology of Sex Differences** (3) Poppen
Relevant biological, psychological, and sociological influences on males and females in the development of sex differences; hormonal differences, gender identity, differential socialization of sons and daughters, masculinity/femininity, cultural evaluation of male and female roles. Survey of relevant psychological theory. Emphasis on empirical research and hypothesis testing.

151 **Social Psychology** (3) Hays
Social foundations of behavior: cognition, motivation, role behavior, communication, small-group processes, and attitudes. (Fall and spring)

154 **Psychology of Crime and Violence** (3) Silber
Examination of many psychological aspects of criminal behavior; personality of criminals and of psychological processes affecting behavior (Spring)

156 **Psychology of Attitudes and Public Opinion** (3) Staff
Psychology of opinion formation, measurement of opinion, social determi-

nants of attitudes, psychological processes in propaganda, bases of receptivity to propaganda, psychological warfare. Staff

158 **Psychology of Interpersonal Attraction** (3)
Psychological bases for interpersonal attraction; emphasis on personal variables, relevant theoretical approaches, and interpersonal processes. Staff

161 **Comparative Psychology** (3)
Lectures and demonstrations on animal psychology. Psychological processes in infrahuman organisms, evolution of behavior, the place of animal experimentation and research in psychology.

168 **Principles and Techniques in Neuropsychological Research** (3) Rothblat
Introduction to basic anatomical, physiological, and behavioral techniques used in neuropsychological research to explore relationships between the brain and behavior. Admission by permission of instructor. Laboratory fee, $20. Staff

170 **Clinical Psychology** (3)
An exploration of the history, functions, and problems of the clinical psychologist. Assessment, treatment, community approaches, ethics. Prerequisite: Psyc 101, 131. Staff

188 **Attitudes Toward Death and Dying** (3)
Exploration of the many different aspects, attitudes, and experiences associated with the process of death and dying. Limited to juniors and seniors. Staff

191 **Independent Research in Psychology** (3)
Opportunity for work on individual library or experimental projects. Open to qualified students by permission; arrangements must be made with the sponsoring faculty member prior to registration. May be repeated once for credit. (Fall and spring) Abravanel

192 **Field Experience in Psychology** (3)
Senior psychology majors will spend a minimum of six hours a week in a local mental health, rehabilitation, school, or community setting. Students registering for this course must have blocks of time available in their class schedules. (Fall and spring) Rice, Wa

196 **History and Systems of Psychology** (3)
Senior capstone course that includes a survey and integration of the major viewpoints and concepts of psychology. Required of psychology majors. Staff
(Fall and spring)

197 **Honors Seminar in Psychology** (3)
Selected topics in psychology that change from semester to semester. Intended primarily for juniors who plan to enroll in Psyc 191 (independent research) in the senior year. May be repeated for credit. Staff

198 **Current Research Issues in Psychology** (3)
Conducted as a seminar. Recent experiments in psychology, including those performed by members of the class; emphasis on student participation. May be repeated for credit.

**Third Group**
Third-group courses are limited to graduate students in psychology, except by special permission of instructor.

202 **Psychological Research Methods and Procedures** (3) Abravanel, Holmstrom
Required in all graduate psychology programs. Prerequisite: graduate standing, a laboratory course in psychology, and an elementary course in statistics.
(Spring)

203–4 **Experimental Foundations of Psychology** (3–3) Hashtroudi, Rothblat, and Staff
Required of doctoral students in psychology during first year of study. Psyc 203: Basic issues in learning and memory. Psyc 204: Physiological processes; sensation and perception. (Academic year)

207–8 **Psychological Assessment** (3–3) Holmstrom, Staff
Open only to clinical graduate students in the Department of Psychology.

Theoretical and clinical aspects of assessment; includes interviewing, psychometric tests, and projective techniques. Two-hour laboratory—diagnostic work at clinical facilities. Material fee, $10 per semester. (Academic year) Staff

209 **Seminar: Psychology of Motivation** (3) Staff
Various theoretical approaches to the psychology of motivation; systematic concepts and experimental findings deriving from each approach. (Spring)

211 **Assessment of Cognitive Functioning** (3) Staff
Concepts of intelligence and achievement and their assessment through a variety of individual procedures. Material fee, $20. Admission by permission of instructor. (Summer)

212 **Personality Assessment by Projective Techniques** (3) Staff
Methods of personality assessment, primarily the Rorschach. Material fee, $15. Admission by permission of instructor. (Summer)

213–14 **Seminar: Developmental Psychology** (3–3) Abravanel, Brandt
Psyc 213: research and theory in developmental psychology, with emphasis on cognitive, perceptual, and language functioning development. Psyc 214: current research and theoretical issues in cognitive and social development in infancy and the social bases of communication and language. (Academic year)

215 **Psychodynamic Approaches to Child Assessment and Therapy** (3) Miller
A broad range of issues in child personality development will be considered, with special focus on drives, interpersonal relations, defenses, intellectual capacities, and moral development. Admission by permission of instructor. Material fee, $10. (Fall)

216 **Psychological Assessment by Graphic Means** (3) Staff
Examination of graphic procedures for assessment of intelligence and personality; clinical use and evidence of validity. Common interpretive principles sought Human figure drawings and free paintings as examples. Admission by permission of instructor. (Fall)

218 **Seminar: Systems of Psychotherapy** (3) Silber
Introduction to theory and technique of psychotherapeutic approaches: psychoanalytic, ego centered, nondirective, transactional, and others. Original sources surveyed. (Fall and summer)

219 **Group Dynamics** (3) Miller
Relationship of the individual to groups, collectivities, and larger social systems. Theory, research, and applications of group and organizational processes, emphasizing contributions of Freud, Bion, Slater, Miller and Rice. Opportunity is provided to attend a group dynamics workshop, which is recommended but not required. Enrollment limited.

220 **Seminar: Abnormal Psychology** (3) Miller
Study of selected problems of psychopathology. (Fall)

221–22 **Seminar: Group Psychotherapy** (3–3) Borriello
For graduate students in the clinical psychology program. Open to others if space permits and with permission of instructor. Psyc 221: Survey of group therapy approaches; Psyc 222: Supervised experience with therapeutic groups. Prerequisite to Psyc 221: Psyc 219. (Alternate academic years)

223 **Seminar: Human Memory** (3) Hashtroudi
Selected topics of current research interest in the area of human memory. Emphasis on encoding and retrieval processes, amnesia, and disorders of memory. (Spring)

225 **Behavioral Approaches to Child Assessment and Therapy** (3) Rohrbeck
Child assessment and treatment from a behavioral viewpoint. The application of conditioning, reinforcement, and shaping principles with reference to specific disorders of childhood.

226 **Seminar: Clinical Psychology of Childhood and Adolescence** (3) Brandt
For graduate students in psychology; open to others with permission of instructor Exploration of major topics concerning psychopathology in children and adolescents, discussion of nosological issues with emphasis on theoretical and research literature.

227–28 **Seminar: Principles of Psychotherapy** (3–3) Kahn
For graduate students in clinical psychology; open to others with permission of instructor, if space permits. Patient's needs and demands on the therapist. Case participation heavily relied upon. Prerequisite: Psyc 218.
(Academic year)

229 **Seminar: Principles of Behavior Change** (3) Peterson
Behavioral learning methods and theory applied to clinical problems.
(Fall)

230 **Methods in Applied Behavior Analysis** (3) Staff
Methodology used in clinical behavioral research and other areas, using a small number of subjects. Research designs and data collection techniques are emphasized. (Fall)

231 **Development of Psychometric Instruments** (3) Mosél
Quantitative techniques and principles used in construction, standardization, and evaluation of personality and ability measures for research and practice; quantification of human judgment for measurement purposes. Prerequisite: course in tests and measurements and an elementary course in statistics. (Fall)

232 **Ego Psychology and Theories of Object Relations** (3) Holmstrom
Emphasis on theoretical contributions of Freud, Hartmann, Klein, Kernberg, Kohut, and others. Assessment and treatment are addressed, primarily with reference to investigations of borderline and characterological disorders.
(Spring)

234 **Seminar: Theory of Psychological Measurement** (3) Mosél
Examination of classical test theory (which underlies most current test construction and interpretation) and the newly emerging area of item-response theory. Recent developments in validity generalization.
(Spring—alternate years)

235 **Seminar: Community Mental Health** (3) McNally
For graduate students in the Department of Psychology; open to others, with permission of instructor, only if space permits. Survey of issues and techniques in community mental health; emphasis on educational systems and community mental health issues.

236 **Seminar: Minorities and Mental Health** (3) McNally
Factors affecting the mental health of minorities. Treatment considerations and differences in theoretical approaches with respect to minorities.
(Spring) Staff

237–38 **The Practice of General Psychology** (3–3)
Application of psychological principles and findings to a wide spectrum of human problems. Professional issues facing the psychologist offering services. Participation in the development, implementation, and evaluation of applied psychological services and projects. (Academic year)

240 **Seminar: Selected Topics in Psychopathology** (3) Silber (Spring)
Examination of current research and theory in psychopathology. Staff

241–42 **Family Systems: Theory, Practice, and Research** (3–3)
Family dynamics and their implications for assessment and treatment. Special emphasis on the role of research in the process of evaluation of family systems and family therapy. Enrollment limited to advanced doctoral students in clinical psychology. (Academic year) Miller

243 **Psychoanalytic Theory and Research** (3)
An introduction to classical and modern psychoanalytic theory and research. A review of Freud's central works, focusing on his case studies and their role in theory development. Emphasis on instinct theory, with comparisons to contemporary studies of dreams, infant observation, male and female personality development, psychopathology, and related topics.

244 **Theories and Processes of Organizational Management** (3)
Basic functions and techniques of organizational management—design, control, direction, and decision making—examined from the viewpoint of behavioral science.

245 **Seminar: Organizational Behavior** (3) Mosél
Analysis of organizational behavior; emphasis on motivation and productivity. Recent research on employee attitudes, primary group, supervisory leadership, formal and informal organization, job design. (Fall)

246 **Seminar: Personnel Evaluation Techniques** (3) Sharf
Techniques of personnel selection and performance evaluation. Employment tests, personal data, assessment interviews, performance ratings, and assessment centers. Consideration of federal guidelines in employee selection. Includes practicum.

247 **Seminar: Psychology of Leadership in Organizations** (3) Offermann
Theories and issues related to the emergence and effectiveness of leaders, with focus on leadership behaviors and processes in organizations.

248 **Organizational Behavior Research Applied to Organizational Intervention and Change** (3) Staff
Emphasis on development of models of organizational effectiveness; design of valid diagnostic instruments; implementation of research strategies; establishment of program-evaluation criteria. (Fall)

249 **Organizational Behavior Modification** (3) Mosél
Application of operant reinforcement, behavioral systems analysis, and other experimentally derived procedures, such as goal setting and feedback, to improving individual and group work performance. New approaches to intrinsic job motivation based on covert reinforcement principles. (Spring—alternate years)

250 **Human Resources Management** (3) Staff
An examination within a psychological systems perspective of the requirements for integrating employee assessment, placement, training, and motivation modules into a unified human resources development program. Emphasis on models and techniques of organizational development and the utilization of key organizational factors to determine content of the program.

253–54 **Social Psychological Theories and Applications** (3–3) Offermann
Social psychology theories, conceptual approaches, and their applications. Psyc 253: Focus on attitude formation and change and on social-cognition, person perception, attribution, information processing, attraction, stereotyping. Psyc 254: Analysis of intentional and unintentional social influence processes and their effects on behavior. Current research on conformity, social power, social exchange, and impression management. (Academic year)

255 **Applied Research Methods: Research Design** (3) Poppen
Analysis of problems in research design in basic and applied social psychological research. Focus on conceptualization, operationalization of variables, and experimental and quasi-experimental design. (Fall)

256 **Applied Research Methods: Data Collection and Analysis** (3) Poppen
Methods of data collection and analysis, especially in field settings and surveys with nonexperimental designs. Topics include methods of obtaining information (questionnaires, interviews, records); creation of indicators; exploratory analysis of large-scale data bases; analysis and interpretation of data when research units have not been randomly assigned to treatments. (Spring)

257 **Current Topics in Social Psychology** (3) Poppen, Offermann
Advanced seminar with focus on major theoretical approaches, research, or problem areas within field of social psychology. Topic changes each semester. (Fall and spring)

260 **Psychology of Work Group Development** (3) Offermann
Examination of theory and research on groups as task performance systems. Approaches to team development as a means of improving work group effectiveness, including goal setting, role clarification, increasing interpersonal skills, and conflict resolution. (Spring)

263 **Evaluation Research** (3) Rice
Research issues and methods in evaluating the impact of organizational and

social intervention and service programs. Specification of program goals and effectiveness criteria; measurement problems; experimental and quasi-experimental designs; political problems surrounding evaluation research. (Spring, even years)

268 **Seminar: Neuropsychology** (3) Rothblat
Selected problems in research relating the brain and behavior. Independent topics each semester, such as sensory processing, brain development and behavior, clinical aspects of nervous system function.

272 **Seminar: Theories of Personality** (3) Staff
Emphasis on theoretical problems and methodology in the field of personality study. (Fall, odd years)

274 **Comparative Psychology and Ethology** (3) Staff
Synthesis of the principles and findings of ethology and comparative psychology. Examination of the theories and findings of Lorenz, Tinbergen, and Jakob von Uexküll in the light of recent experimental investigations. (Fall, even years)

281 **Clinical Neuropsychology I** (3) Rothblat
Analysis of experimental and clinical findings from studies attempting to localize and interpret human brain dysfunction, with emphasis on perceptual and cognitive behavior. Topics include overviews of neuroanatomy and neurological techniques, clinical description and theoretical consideration of major neuropsychological disorders, mechanisms underlying recovery of function and potential for rehabilitation. Graduate students in fields other than psychology admitted by permission of the instructor.

282 **Clinical Neuropsychology II** (3) Staff
Examination of important psychological procedures for the assessment of human brain dysfunction. Instruments and batteries such as the Bender-Gestalt, Wechsler Adult Intelligence Scale, Halstead-Reitan Neuropsychological Battery, and Luria's Neuropsychological Tests. Prerequisite: Psyc. 211, 212, 281, and permission of the instructor.

289 **Seminar: Current Topics in Experimental Psychology** (3) Staff
Review and discussion of contemporary research and theory in a specialized field of psychological study, by leaders in the field. Independent topics each semester; may be repeated for credit. (Fall and spring)

290 **Seminar: Macro-organizational Behavior** (3) Ric
Examination of variables characterizing the total organization as the unit of analysis; the relationship of such variables to the behavior of the individual. Complexity, power, and conflict will be considered, along with contextual dimensions such as organizational environment. (Fall, odd years)

291 **Theories of Organizational Behavior** (3) Staff
Examination of current theoretical models and research. (Spring) Walk

292 **Seminar: Perception** (3)
Study of current research and theory in the experimental psychology of perception and perceptual development. (Spring) Staff

295 **Independent Research in Psychology** (3) Staff
Individual library or experimental research under supervision of staff member. Arrangements must be made with sponsoring faculty member prior to registration. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

**Fourth Group**

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy major field examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## PUBLIC ADMINISTRATION—GRADUATE PROGRAMS

Professors D.S. Brown *(Emeritus)*, W. Sommers *(Emeritus)*, S.R. Chitwood, M.M. Harmon, S.J. Tolchin, W.C. Adams, B.L. Catron, M.E. Keane *(Distinguished Visiting)*, C.F. Bingman *(Visiting)*, C.W. Washington
Professorial Lecturers H.M. West III, B.T. Pitsvada, G.H. Honadle
Associate Professors K.E. Newcomer *(Chair)*, J.F. Kasle, J.E. Kee, C.J. McSwain

See the School of Government and Business Administration for programs of study in Public Administration leading to the degrees of Master of Public Administration and Doctor of Philosophy.

### Second Group

125 **Managing Public Policy** (3) Newcomer, Harmon, Kee
Contemporary concepts and issues in public administration and management. Major trends and approaches to governmental administration in the U.S., including the changing federal role, roles of the public sector in relation to the private sector, and managing public agencies at all levels. (Fall and spring)

### Third Group

205 **Introduction to Public Administration and Management** (3) Chitwood
Provides frame of reference for study of public administration. Historical development, contemporary approaches, roles of the public manager. Ethics and norms, administrative responsibility and public interest. Management in the public sector. (Fall and spring)

208 **Ethics and Public Values** (3) Catron
Ethical dimensions of personal and professional judgments of public officials. Cases are used to consider the ethos of public organizations and the moral foundations of public policy. (Fall)

212 **Legislative Management** (3) Tolchin, Kasle
Analysis of Congress as a management system; examination of its internal administration and its role in formulating policy through legislation. Executive–legislative relationships, staffing practices, budget processes, leadership, rules and procedures, oversight functions, and the management of foreign policy are examined. (Fall)

213 **Administration in the Federal Government** (3) Tolchin
Critical analysis of the structure and administration of the federal government from both a managerial and political perspective. Emphasis on executive branch organization, integration, and coordination, as well as current trends in government regulation, accountability, and effectiveness. (Fall)

215 **Law and the Public Administrator** (3) Chitwood, Kasle
Exploration and analysis of the functions of law in a democratic society. Emphasis is placed upon the procedural, historical and jurisprudential dimensions of American law. This broad perspective seeks to convey understanding of the law as a legal and moral force guiding and constraining public decision making. (Spring)

216 **Federal Government Regulation of Society** (3) Tolchin
Analysis of the federal regulatory process as it affects the public and private sectors. Specific problems involving presidential management, policy conflicts, reform efforts, legislative oversight, and economic deregulation are emphasized. Same as BAd 203. (Spring)

217 **Seminar: Development Administration I** (3) Honadle
The nature of program development and implementation. Specific organization and management problems of less developed countries. National, cultural, and political context. The giving of assistance: types of technical aid; problems of working with aid givers; analytical methods. (Fall)

218 **Seminar: Development Administration II** (3) Honadle
The transfer of administrative capability from one country to another.

Political and administrative development theories. The role of innovation
Strategies of institutional development. Organization of natural resource
management. (Spring)

221 **Organization Theory and the Public Sector** (3) Harmon
Analysis of organization theory with special focus on public organizations.
current issues in organization theory; decision making; the organizational
environment and the changing nature of organizations in a postindustrial
society. (Fall and spring)

223 **Management Factors in Complex Organizations** (3) McSwain
Analysis of the nature and characteristics of management in organizations.
Bureaucracies and their behavioral patterns. Approaches to management and
leadership, particularly in public organizations; influence and control sys-
tems. Future trends. (Fall and spring)

224 **Managerial Leadership in Complex Organizations** (3) Chitwood
What the manager must know and do to provide leadership and guidance
in large, complex organizations. An exploration of conscious and uncon-
scious factors and processes conditioning effective executive and manageria
leadership. (Spring) Staff

231 **Personnel Management** (3)
Same as BAd 210. McSwain

232 **The Personnel Manager** (3)
Same as BAd 212. West

233 **Seminar: Manpower Planning, Development, and Utilization** (3)
Examination of public and private manpower trends, problems, policies, and
programs. Exploration of approaches to the analysis and administration of
manpower programs. Analysis of impact of economic, political, and social
factors on manpower. (Fall) Frame

235 **Seminar: Technology Change and Professional Human Resource Planning** (3)
Addresses human resource problems arising from automation and othe
technological changes. Evaluation of these developments in government
business, and educational organizations, and their implications for pro
ductivity, employment, training, and education. Analysis of economic
political, and social factors influencing public and private human resource
policies. (Spring) Burdetsky

236 **Unionism and Collective Bargaining** (3)
Same as BAd 217. (Fall) Washington

242 **Administration of State and Local Governments** (3)
Examination of state and local governmental structures and functions, the
place within the federal system, their revenue sources, their limitations, an
the alternatives available to encourage more effective administration to mee
public and private demands. (Fall) Washington, Ke

245 **Intergovernmental Relations** (3)
Assessment of the impacts and consequences of changes in the administra
tion of intergovernmental policies and programs in the federal system
Legislation, roles, and responsibilities of federal, state, regional, and loc
systems are examined from both theoretical and practical vantage points.
McSwa

246 **Dynamics of Citizen Participation in Administration** (3)
Review of the basic theory and principles of democracy in the America
system of governance. Analysis of the nature of participation in a pluralistic
society, including the characteristics and dynamics of citizen-based organiza
tions. Exploration of effective methods or models by which citizens ma
contribute to administration. (Fall) Ke

248 **Financing State and Local Government** (3)
Analysis of the theory and practice of public finance in state and loca
governments. Includes the financing of services through municipal taxation
intergovernmental funds, debt instruments, and other revenue sources.
Review of expenditures as well as financial management practices. (Fa

249 **Urban Public Policy** (3) Washington
Examination of selected national policies and their effects on urban areas and governments. Emphasis on policy dimensions of urban systems and their relationship to the social, political, and economic context. Against the background of urban politics and administration, areas of health, education, welfare, manpower, transportation, and housing will be addressed. (Spring)

251 **Governmental Budgeting** (3) Staff
Survey of the basic concepts, principles, and practices in governmental budgeting; interrelationship of planning, programming, and budgeting; their role in the management process. (Fall)

252 **Public Expenditure Analysis and Planning** (3) Kee
Intensive analysis of the concepts and principles of economics as applied to the public sector and the analytic techniques used by government agencies for planning, allocating, and managing scarce resources in the implementation of public programs. Topics include benefit–cost analysis, program budgeting, productivity, and performance measurement. (Fall and spring)

253 **Financial Management in the Public Sector** (3) Staff
Intensive analysis of the concepts, principles, and general practices of financial management within federal departments and agencies, focusing on the interrelationships of financial and program functions and drawing on the several financial disciplines of budgeting, accounting, and auditing. (Spring)

260 **Policy Formulation and Administration** (3) Tolchin
Impact of economic and political factors on public policy formulation and implementation; intensive analysis of the analytical, normative, and decision-making models of the policy process with special emphasis on their relationship to current policy problems. (Fall and spring)

261 **Policy Analysis in Public Administration** (3) Catron, Newcomer
Current issues in public policy analysis. Conceptual problems encountered in policy analysis. The role and limits of analytic techniques in the development, implementation, and evaluation of public policy. (Fall and spring)

264 **Public Program Evaluation** (3) Newcomer
Theory and practice of program evaluation and evaluative research. Exploration of scope and limitations of current practice in evaluation, considering economic, political, social, and administrative factors. Examination of methodological considerations for design, data collection, analysis, and dissemination. (Spring)

267 **Cases in Public Policy** (3) Catron
Critical analysis of topical issues in public policy, using a case-study approach. Specific issues covered will vary. Designed principally for M.P.A. students in the last half of their program. (Summer)

270 **Telecommunication Administration** (3) Kasle
Human factors in telecommunication innovations within a public organization. Federal role in research, development, and regulation of telecommunications. Acquisitions process for major systems in federal agencies. International telecommunication policies and controversies. (Fall and spring)

271 **Telecommunications Management** (3) Kasle, Kee
Emphasis on planning in regulated industries, managing in a technology-based industry, and personnel development. Varieties of management styles and their strengths and weaknesses; legal constraints; responsibilities and ethics. (Fall and spring)

272 **Telecommunications Finance** (3) Staff
Theories and approaches to telecommunications economics and finance. Examination of cost and price setting, cost allocation, price de-averaging in response to competition, tariffs, accounting and jurisdictional separations, predatory pricing, and aggregate valuation and operating measures. (Spring)

274 **Regulation of Communications Common Carriers** (3) Kasle
The history, development, law, and public policy issues of communications common carriers, emphasis on telephone and satellite industries; the impact

of antitrust law; the effects of divestiture; the reconfiguration of the telephone industry; future trends. (Fall and spring)

275 **Telecommunications Choices for Public Managers** (3) Kasle, Kee
Critical management and policy issues facing the public manager in telecommunications. Location of managerial responsibility, planning methods and needs surveys, centralized vs. decentralized management and control, in-house facilities vs. cost/time sharing, controlling costs, productivity implications, and networking. (Spring)

280 **Purchasing and Materials Management** (3) Sherman
Same as BAd 280.

281 **Procurement and Contracting** (3) Sherman
Same as BAd 281.

282 **Government Contract Administration** (3) Sherman
Same as BAd 282.

283 **Pricing and Negotiation** (3) Sherman
Same as BAd 283.

285 **Systems Procurement and Project Management** (3) Staff
Same as BAd 285.

288 **Field Problem Studies in Public Administration** (3)
Field research and approved internships on selected issues and aspects of public administration, including specific policy and management problems arising in governmental agencies and related public institutions. Open to master's students upon completion of 9 hours toward the degree program and with the consent of the intern coordinator. (Fall and spring) Staff

289 **Public Program Management and Policy Implementation** (3)
A review of the diverse concepts and methods in public administration; an analysis and integration of the salient political, economic, managerial, and leadership values and issues in implementing public policies. Open only to M.P.A. degree candidates in their final semester of study; serves as a capstone seminar to the M.P.A. program. (Fall and spring) Staff

290 **Special Topics in Public Administration** (3)
Experimental course; new course topics and teaching methods. May be repeated once for credit.

295 **Research Methods** (3) Adams, Newcomer
Theory and practice in research methodology. Data sources and gathering; research models and designs. Critical evaluation of research studies. Emphasis on application of research methods to policy questions. (Fall and spring)

296 **Statistical Applications in Public Administration** (3) Adams, Newcomer
Use of statistics, computers, and SPSS in research and program evaluation. Emphasis on interpretation and use of statistics. Development of basic statistical competency; frequency distribution, sampling, central tendency, variability, correlation, probability, regression; computer assistance. (Fall and spring)

298 **Directed Readings and Research in Public Administration** (3) Staff
Supervised reading in selected fields within public administration. Admission by permission of instructor. May be repeated once for credit.

299 **Thesis Seminar** (3) Staff
Examination of thesis standards, research philosophy, and methodology in public administration.

300 **Thesis Research** (3)

**Fourth Group**

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. They are open to selected master's students upon petition approved by the Associate Dean. Tolchin

311–12 **Seminar: Public–Private Sector Institutions and Relationships** (3–3)
An analysis and critique of alternative theoretical frameworks for describing

understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society. Prerequisite: doctoral degree candidate status.

323 **Seminar: The Complex Organization** (3) McSwain
Unique problems of complex organizations: public, private, and mixed. Emerging concepts and theories. Selected issues.

373 **Seminar: Public Administration and American Political and Social Institutions** (3) Washington, McSwain
Supervised in-depth study of contemporary and historical literature in selected fields in public administration. (Spring)

374 **Seminar: Trends in Public Administration Theory** (3) Harmon
Survey of contemporary normative and epistemological issues in public administration theory and practice. Analysis of the past and present influence of logical positivism, behaviorism, humanism, existentialism, and phenomenology. (Fall)

377 **Seminar: Social Action and Public Policy** (3) Catron
Interdisciplinary approach to the normative foundations of public policy. Focus on theoretical problems of social action; interrelation of theory and practice. (Spring)

393 **Substance and Method: Current Topics and Research in Public Administration** (1) Staff
*(Formerly 3 credits)*
Current research discussed in a colloquium setting. The conduct of research and presentation of research findings. May be repeated for credit.

398 **Advanced Reading and Research** (arr.) Staff
Limited to doctoral candidates preparing for the general examination. May be repeated for credit.

399 **Dissertation Research** (arr.) Staff
Limited to doctoral candidates. May be repeated for credit.

## PUBLIC POLICY—GRADUATE PROGRAMS

**Doctoral Committee on Public Policy**
A.V. Adams *(Chair)*, E. Berkowitz, W.B. Griffith, C.J. Lange, P. Langton, W.H. Lewis, C.E. Rice, R.W. Rycroft, C.T. Stewart

The Graduate School of Arts and Sciences offers interdisciplinary programs leading to the degrees of Master of Arts and Doctor of Philosophy in the field of public policy. The master's program allows students to concentrate in one of five policy areas: environmental and resource policy, gerontology, philosophy and social policy, telecommunications policy, or women's studies. The doctoral program, intended for those wishing to pursue academic or policymaking careers, is concerned with policy research and analysis; students may select an applied field of study in education policy, employment policy, health policy, natural resources and environmental policy, national security policy, and science and technology policy.

*Master of Arts in the field of public policy*—Required: the general requirements stated under the Graduate School of Arts and Sciences. For specific concentration requirements, consult the Graduate School office.

*Doctor of Philosophy in the field of public policy*—Required: the general requirements stated under the Graduate School of Arts and Sciences, including (1) a pre-qualifying core curriculum consisting of Econ 211–12, 221–22; PAd 221; PSc 203; and one course chosen from PSc 216, 217, or 218; (2) a written qualifying examination; (3) a post-qualifying core consisting of Phil 255, Soc 776, and PPol 201; (4) a minimum of 18 hours related to one of the six policy fields; (5) completion of research skills requirements in two of the following: statistics, computer programming, and historical research methods; and (6) completion of the general examination in the form of a public policy paper.

201 **Seminar in Research Methods and Design** (3) Staff
Research methods from an interdisciplinary social science perspective, including model construction, research design, measurement, sampling, data gathering (survey research, content analysis, and aggregate data), and secondary data. Prerequisite: an introductory social science research methods course. (Spring)

231 **Administrative Law and Public Policy** (3) Carrow
An examination of the law-making powers of administrative agencies and the extent to which they are responsible for public policies. Focus on the administrative rule-making function as the most pervasive law-making function of the agencies and on case studies selected from each of the three major areas of administrative power—social welfare, social action, and economic regulation. Offered as the demand warrants.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination.

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit.

## RELIGION

*University Professor* S.H. Nasr
*Professors* R.G. Jones, H.E. Yeide, Jr. *(Chair)*, D.D. Wallace, Jr., A.J. Hiltebeitel
*Associate Professorial Lecturer* E.S. Jospe
*Assistant Professor* S.A. Quitslund

*Bachelor of Arts with a major in religion (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken to satisfy the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)
2. Prerequisite courses—Rel 1, 2.
3. Four required courses in related areas—(a) 6 semester hours in studies of cultures other than American and English (preferably a foreign language), and (b) 6 semester hours in either literature, philosophy, or history.
4. Required courses in the major—30 semester hours, including at least 21 hours of upper-level courses. Twelve of these hours must be chosen from one of the following religious traditions: Christianity, Hinduism, Islam, and Judaism. Appropriate graduate seminars may be approved as substitutions for advanced-level courses. The program must include Rel 101 and at least one course each in Hebrew Scriptures and in New Testament.

Special Honors are awarded to students who meet the requirements stated under Regulations and who complete an honors thesis by enrolling in Rel 191.

It is recommended that students include the study of foreign languages in their undergraduate program, including a language crucial to one of the religious traditions. All students expecting to enter graduate school are urged to study French or German.

*Minor in religion*—Required: a minimum of 18 semester hours in religion, of which at least 6 must be upper-level courses. The minor program will be developed in consultation with the departmental advisor. Rel 101 is strongly recommended for all participating students.

*Master of Arts in the field of religion*—Prerequisite: the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree, and reading knowledge in a foreign language related to the program of study (which may be demonstrated after enrollment in the program).

Required: the general requirements stated under the Graduate School of Arts and Sciences. Of the 24 semester hours of required courses (exclusive of the thesis), at least 12

must be in third-group religion courses; a maximum of 9 may be in a closely related field outside the Department of Religion as approved by the department. The Master's Comprehensive Examination must cover three fields (the thesis research must be on one of these three fields) selected from the following: the Hebrew Scriptures, the New Testament, Christianity, Hinduism, Islam, Judaism, history of religion in America, modern religious thought, ethics, sociology of religion, and history of religions. A reading knowledge examination, usually in French or German, is required; however, Hebrew or Greek is acceptable for those students whose thesis area is in the Biblical field and Arabic, Sanskrit, or an Eastern language for those whose thesis area is in the history of religions.

*Master of Arts in the field of religious education*—Prerequisite: the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree, and reading knowledge in a foreign language related to the program of study (which may be demonstrated after enrollment in the program).

Required: the general requirements stated under the Graduate School of Arts and Sciences. Of the 24 semester hours of required courses (exclusive of the thesis), at least 6 must be in third-group religion courses; a maximum of 12 may be in a closely related field outside the Department of Religion as approved by the department.

*Master of Arts in the field of religion and medical care*—Prerequisite: (1) the degree of Bachelor Arts with a major in religion from this University, or an equivalent degree; (2) a first professional theological degree; or (3) acceptable academic work required of entering medical students who have not earned a bachelor's degree but are pursuing the degree of Doctor of Medicine. Certain courses in this program are offered only through off-campus centers of the Division of Continuing Education.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of approved course work with or without a thesis. Students must elect course work covering four fields selected from clinical pastoral care, religion, sociology, psychology, health services administration, and medicine. The course work in these fields must be distributed as follows: 12 semester hours each selected from two fields and at least 6 hours in clinical pastoral care. The Master's Comprehensive Examination must cover three fields selected from the list above, one of which, as approved by the department, must be outside the Department of Religion.

*Master of Arts in the field of history of religions—Hinduism* (Consortium of Universities program)—Prerequisite: the Bachelor of Arts degree from this University with suitable background in the study of religion of South Asia, or an equivalent degree, and reading knowledge in a foreign language, usually French or German (which may be demonstrated after enrollment in the program).

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 24 hours of course work (exclusive of thesis) selected from upper-division and graduate courses of member universities of the Consortium as determined by the Department of Religion, including a sequence of four courses in the literature of the Hindu tradition and one course in method in history of religions. A degree candidate at George Washington University must take a majority of the credit hours toward the degree from this university. The Master's Comprehensive Examination must cover the following: methods in the study of religions, thematic comparisons between the Hindu tradition and at least two other religious traditions, including at least one Western tradition, and a special field in Hindu tradition. A student must take at least two semesters of either Sanskrit or Hindi in addition to the 30 hours of required courses for graduate credit. More complete information regarding courses and requirements is available from the program advisor, Professor A.J. Hiltebeitel, Department of Religion.

Doctor of Philosophy in the field of American religious history—See History.

**First Group**

1 **Introduction to World Religions: West** (3) Staff
*(Formerly Rel 2)*
Examination of the religions of the ancient Mediterranean and the major religions of the West. Religious foundations of Western civilizations. The development of Judaism, Christianity, and Islam and their confrontations with secularization and political upheaval in the modern world. (Fall and spring)

2 **Introduction to World Religions: East** (3) Staff
*(Formerly Rel 1)*
Examination of the major religions of the East and comparison with religions in the West. Approaches to the cross-cultural study of religion. Hinduism, Buddhism, and the religions of Tibet, China, and Japan are studied with respect to their history and their encounter with modernity. (Fall and spring)

9 **The Hebrew Scriptures** (3) Jones
The history, literature, and religious thought represented by the Hebrew Scriptures (Old Testament). Continuities and contrasts between Israel and the ancient Near East are considered through study of the world view, oral and literary tradition, main religious ideas, and chief figures and movements of the biblical literature. (Fall and spring)

10 **The New Testament** (3) Jones
Literature and history of earliest Christianity in the setting of the religious movements of the Greco-Roman world and developments within Judaism. The meaning of the earliest Christian proclamation about the significance of the life, teaching, and death of Jesus of Nazareth becomes the basis for tracing the formation and expansion of the Christian movement. Special attention to Jesus and Paul. Developments in worship, church structure, and the rise of early theological affirmation. (Fall and spring)

23 **Judaism: Identities and Ideas** (3)
Exploration of important practices and beliefs in classical and modern times. Study of people and texts that confront tradition and change. This course presents several academic approaches to the description and definition of Judaic ways of life. Readings and discussions focus on the myths and rituals of Judaism. (Fall and spring)

91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course offered by the Departments of East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Political Science, and Religion. A comprehensive and integrated introduction to the civilization and present problems of East Asia. (Spring)

**Second Group**

101 **Theories in the Study of Religion** (3) Staff
Seminar taught jointly by the faculty of the Department of Religion. Analysis of different ways in which religious phenomena can be approached. Readings and discussion of some of the epoch-making books in the development of the study of religion. (Fall)

103 **The Prophets** (3) Quinlan
Development of the prophetic movement in Israel; cultural, economic, literary, and religious dimensions; elements of lasting value in the prophetic teaching. Study of selected prophets. (Fall)

104 **The Life and Thought of Jesus** (3) Quinlan
Comprehensive study of the life and teachings of Jesus with critical attention to sources. Quest for the historical Jesus. (Spring)

105 **The Life and Thought of Paul** (3) Quinlan
Backgrounds of early Christianity, first-century religious and social conditions affecting the spread of Christianity, the life and journeys of Paul. Paul's presentation of the Christian faith.

107 **Rabbinic Literature and Thought** (3)
Readings of the Mishna, Tosefta, Talmuds, midrashim, and liturgical works in English translation. Methods of literary and historical analysis introduced and applied. Individual research projects.

111 **Myth, Epic, and Novel** (3) Hiltebeitel
Religious themes and images of the hero and their cultural significance in literature: e.g., Indo-European, Biblical, Babylonian narrative traditions; Greek epic and drama; Dante, Milton, Dostoevsky, Kafka, Hesse, Faulkner, Beckett.

113 **Early Post-Biblical Judaism** (3)
History of Judaism from the time of Ezra through the destruction of Jerusalem in 70 CE—canonization of the Pentateuch, Hellenism, Maccabean revolt, growth of sectarian movements, Herod, ferment against Rome in context of Eastern and Western political currents. Use of primary sources, especially the Bible, Josephus, and rabbinic and noncanonical writings.

114 **Judaism in the Rabbinic Period** (3)
From 70 CE through end of rabbinic period. Focus on religious responses to destruction of the Temple; apocalyptic thinking and revolt of Bar Cochba; rabbinic and patriarchal responses to Roman authority; Tannaitic and Amoraic Judaism in Palestine and Babylonia; mystical and folk religion phenomena preserved in art and literature.

115 **Judaism in the Medieval World** (3)
History of relations between Jews and non-Jews. Daily life and education of the ordinary Jew; rabbinical law and interpretation of scripture; Jewish philosophers, mystics, sects, and messianic movements.

116 **Judaism After Emancipation** (3)
Transformation of community and beliefs among Jews beginning with catalyst of their political emancipation. Responses to beginnings of modernity among Jews in Europe, America, and Israel.

121 **Ethics and the World Religions** (3) Yeide
Modern concepts of ethics and their relation to major world religions; religion as stimulus and barrier to moral change; modern moral issues and religious ethics. (Fall)

122 **Christian Ethics and Modern Society** (3) Yeide
Nature and principles of Christian life as developed by the Christian community; problems of personal conduct; application to various social institutions

124 **Contemporary Movements in Theology** (3) Quitslund
Theological approach and systems of a selected number of modern theologians and/or theological movements such as process theology, liberation theology.

126 **Western Mysticism** (3) Quitslund
Study of the phenomenon of religious experience and of selected mystics in Judaism, Christianity, and Islam.

127 **Medicine, Religion, and Healing** (1) Yeide
Total care concept. Importance of religion in medical practice for patient and physician. Concept of the professional, the clergy's role in healing, religious perspective on issues in medical ethics. (Spring)

134 **The Holocaust in Film and Literature** (3) Staff
Study of artistic responses in fiction and nonfiction to a period of supreme importance in Jewish and world history; the attempts on screen and in print to confront and understand this modern catastrophe.

137 **The Land of Israel and the Growth of the Western Religions** (6) Staff

143 **Early Christianity and the Spiritual Life of the Ancient World** (3) Wallace
Rise and development of Christianity in relation to the culture, philosophy, mystery religions, and general religious life of the Greco-Roman world to A.D. 500.

144 **Medieval Faith and Symbolism** (3) Wallace
Christian life and thought in the Middle Ages; mystics, saints, popes, and philosophers.

145 **Religious Currents in the Renaissance and Reformation** (3) Wallace
Transformation of Western man's understanding of his identity and destiny from the end of the Middle Ages to the Age of Reason. (Fall)

146 **Christianity from the Enlightenment to Existentialism** (3) Wallace
Changes in Christian life and thought since 1700, as seen in theology, literature, political life, and religious institutions. (Spring)

155 **Anthropological Approaches to Religion** (3) Simons, Wagner
Same as Anth 155.

157 **Indian Philosophy and Mysticism** (3) Hiltebeitel
Indian speculative and mystical traditions; late *Vedas*, *Upanishads*, *Bhagavad Gita*, Buddhist, and Hindu soteriological systems. (Fall)

158 **Hinduism** (3) Hiltebeitel
Study of continuity and change in Hinduism, with emphasis on historical development and the consolidating features of the religion. Attention to relations between classical and popular living forms. (Fall)

159 **Mythologies of India** (3) Hiltebeitel
The lore of Indian gods (Vedic, Puranic), heroes (epics), and holy men (Hindu, Buddhist, Jain, Tantric); ties with Indian art, caste, cult, cosmology and spiritual ideals. (Spring)

160 **Buddhism** (3) Hiltebeitel
Origin, development, and contemporary status of Buddhist life and thought, its impact on Asia.

161 **Islam** (3) Nasr
Origin, development, and contemporary status of Islamic life and thought, its impact on the Near East. (Fall)

162 **Symbolism in the History of Religions** (3) Hiltebeitel
Religious symbolism, myth, legend, and ritual in the religions of the world; various theoretical analyses.

163 **Islamic Religion and Art** (3) Nasr
Investigation of major forms of Islamic art, such as calligraphy, architecture and urban design; Quranic chanting, poetry, and music in relation to the principles of Islamic revelation. Same as Art 119.

164 **Islamic Philosophy and Theology** (3) Nasr
The major schools of Islamic philosophy and theology, considered in both a morphological and historical manner. The relation between revelation and reason, determination and free will, and divine and human knowledge as well as the relation among science, philosophy, and religion. The development of various schools of thought, from the classical period to the present.

165 **Sufism (Islamic Mysticism)** (3) Nasr
The foundation of Sufism in the Quranic revelation, its subsequent development, and its significance within Islamic civilization. Doctrines and practices of Sufism; history of the Sufi orders; Sufi literature, particularly in Arabic and Persian. The influence of Sufism upon social and political life and its status and role in the contemporary world, both Islamic and non-Islamic.

172 **Religion in American Culture** (3) Wallace
Growth of religious groups and institutions in relation to American culture, development of religious thought, and analysis of the contemporary religious scene. (Spring)

174 **American Judaism** (3) Quitslund
Religious thought and institutions with emphasis on contemporary Judaism. Mythic and ritual life of American Jews, including responses to Israel, diaspora, the Holocaust, family and community dynamics. (Fall)

181 **Women in Western Religion** (3) Quitslund
Historical, theological, and ethical investigation of the image and role of

women in Judaism and Christianity; special consideration of the Biblical experience, the sexual qualifications for religious office, use of male and female images and languages, and contemporary issues. (Fall)

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
Same as Engl/Fren/Ger/Hist 183 and Art 187.

184 **The Thought of Martin Buber** (3) Jospe
Basic principles underlying the Life of Dialogue and application of those principles to all strata of life from interpersonal relationships to the religious realm.

190 **Selected Topics in Religion** (3) Staff
Critical examination of religious phenomena rendered timely by current events or special resources. Topic announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. (Fall and spring)

191 **Senior Honors Thesis** (3) Staff
Required of and open only to undergraduate honors candidates in religion. (Fall and spring)

**Third Group**

209–10 **Seminar: Biblical Studies** (3–3) Jones
Main problems of Biblical literary, historical, and theological criticism.

213 **Seminar: Judaism in Late Antiquity** (3)
Selected topics. (Fall)

*216 **Supervised Clinical Pastoral Education (I–A)** (6) Staff

*217 **Supervised Clinical Pastoral Education (I–B)** (6) Staff

*218 **Supervised Clinical Pastoral Education (III–A)** (6) Staff

*219 **Supervised Clinical Pastoral Education (III–B)** (6) Staff

222 **Seminar: Ethics** (3) Yeide
Selected topics. (Fall)

*223 **Religious and Ethical Perspectives on Medical Problems** (3) Yeide

*225 **The Dynamics of Ministering to the Young Adult** (3) Staff

235 **Seminar: Roman Catholicism in the Modern World** (3) Quitslund
Important leaders and their ideas in selected developments since 1800—doctrinal, spiritual, biblical, liturgical, and ecumenical. Emphasis on the 20th century. (Fall)

237 **Seminar: Theological Analysis** (3) Quitslund
Historical and topical study of the development of important ideas in such areas as Christology, ecclesiology, and death.

238 **Seminar: Contemporary Judaism** (3)
Selected topics.

262 **Seminar: History of Eastern Religions** (3) Hiltebeitel
Selected topics. (Spring)

271 **Seminar: American Religious History to 1830** (3) Wallace
Religious thought and life during the Colonial and early National period. (Spring)

273 **Seminar: American Religious History Since 1830** (3) Wallace
Religious thought and life from the Civil War to the present.

291–92 **Readings and Research** (3–3) Staff
Investigation of special problems. (Academic year)

299–300 **Thesis Research** (3–3)
(Fall and spring)

* Offered as the demand warrants through the Division of Continuing Education at off-campus centers for students in the master's degree program in the field of religion and medical care.

## ROMANCE LANGUAGES AND LITERATURES

*Professors* J.W. Robb, J.A. Frey *(Chair)*, J.F. Burks
*Associate Professors* M.A.B. Coffland, P.G. Sáenz, G. Ludlow, S.R. Barnett, I. Aza
J.M. Thibault
*Assistant Professor* G.P. Huvé
*Adjunct Assistant Professor* A.-C.J. D'Agostino
*Lecturer* M. Ferretti

*Bachelor of Arts with a field-of-study major in (1) French language and literature, (2) Spanish language and literature, (3) Spanish-American literature*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences
2. Prerequisite courses—Fren 1–2–3, 4, 9–10, or equivalent; or Span 1–2–3, 4, 9–10, or equivalent.
3. Required introductory literature courses—Fren 51–52, 91–92, or any 6-hour combination of the two; or Span 51–52, 91–92, or any 6-hour combination of the two.
4. Required for the major—Although there is no specific program of required courses, the student is expected to demonstrate a knowledge of his or her field in breadth and depth by passing a comprehensive examination at the end of the senior year. A proseminar (Fren 199–200 for French language and literature majors or Span 199–200 for Hispanic language and literature majors) is required.

*Minor in French or Hispanic languages and literatures*—Required: 6 semester hours of Fren or Span 51–52, 91–92, or any combination of the two; 12 additional hours selected from among French or Spanish courses numbered 9 and above, including at least 6 semester hours of second-group courses.

**Placement Examinations:** A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

### FRENCH

**Departmental prerequisite:** Fren 4 or equivalent is prerequisite to all courses in French, from Fren 9 and above.

**First Group**

1–2–3 **Introductory French** (4–4–4) Frey and Staff
A three-semester course. Pronunciation, conversation, reading, composition, grammar. Laboratory fee, $35 per semester. (Fall, spring, and summer)

4 **Language and Culture** (3) Thibault and Staff
A study of the history, geography, and culture of France, with emphasis on conversation and composition. Prerequisite: Fren 3 or equivalent. Laboratory fee, $35. (Fall, spring, and summer)

9–10 **Oral and Written French** (3–3) Huvé and Staff
Acquisition of oral and writing skills requisite for effective communication. Prerequisite: Fren 4 or equivalent. (Fall, spring, and summer)

49 **French for Graduate Students** (0)
For graduate students preparing for reading examinations. No academic credit. Tuition is charged at the rate of 3 credit hours. (Fall, spring, and summer)

51–52 **Survey of French Literature** (3–3) Coffland
Readings in French literature from the Middle Ages to the present. Lectures and informal discussions. (Academic year)

91–92 **Analyse de texte** (3–3) Burks
Methodology and vocabulary of literary criticism; application of principles of *explication de texte* to selections from prose, drama, and poetry from the Renaissance to the present. (Academic year)

**Second Group**

103 **Oral French With Emphasis on Pronunciation** (3) Huvé
The sounds of French; elements of phonetics. Exercises in reading and conversation with attention to accent, rhythm, and intonation. Prerequisite: Fren 10. (Spring)

108 **Advanced French Grammar** (3) Thibault
Compositions, drills, dictations. Translations into French. Prerequisite: Fren 10. (Fall)

109–10 **Advanced Oral and Written French** (3–3) D'Agostino and Staff
Readings and discussions based on French culture and civilization. Study of vocabulary and syntax with emphasis on stylistic devices. Oral reports with emphasis on diction. Dictations, translations, compositions. Prerequisite: Fren 10 or equivalent. (Academic year)

111 **Advanced French Conversation: The Language of Government, Politics, and Economics** (3) Huvé
Discussions and questions based on recent articles from the press. (Summer)

119–20 **French Literature of the Middle Ages and the Renaissance** (3–3) D'Agostino
Literary history and the development of ideas. *Les chansons de geste*, courtly literature, satire, the theater, lyric and didactic poetry; Rabelais, Montaigne, *La Pleiade*. Class analysis of texts, collateral readings.

121–22 **17th-Century French Literature** (3–3) Burks
Drama, fiction, poetry, criticism, and philosophy in the Age of Classicism. Fren 123. Study of the major novelists and dramatists of the period. Fren 124: The contribution of Montesquieu, Voltaire, Diderot, and Rousseau to European and American thought of the period. (Academic year)

123–24 **18th-Century French Literature** (3–3) Ludlow

125–26 **19th-Century French Literature** (3–3) Frey, Thibault
Poetry, drama, the novel, and criticism of the 19th century; emphasis on stylistic analysis.

127–28 **20th-Century French Literature** (3–3) Coffland, Thibault
Fiction, poetry, and drama from 1900 to the present. Chronological examination of authors and movements. (Academic year)

130 **Correspondences Between Art and Literature** (3) Thibault
Expression of common preoccupations in diverse media. Readings, slides, lectures, and informal discussions. Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Summer)

133 **Seminar: French Literature** (3) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

151 **Cinema and Literature** (3) Thibault
Interaction between film and literature; aesthetic theories and their applications to film and literary genres. Selected films and readings. May be repeated for credit. (Summer)

183 **Individualism, Reason, and Tradition in Early Modern Europe** (3) Kennedy
Same as Engl Ger Hist Rel 183 and Art 187.

199–200 **Proseminar: Readings for the Major** (3–3) Thibault
Required of all majors. Conferences and group discussions. (Academic year)

**Third Group**

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

## ITALIAN

### First Group

1–2–3 **Introductory Italian** (4–4–4) Coffland and Staff
A three-semester course. Pronunciation, conversation, reading, composition, grammar. Laboratory fee, $35 per semester. (Ital 1 and 3—fall; Ital 2—spring)

4 **Civilization and Culture** (3) Coffland and Staff
A study of the history, geography, and culture of Italy, with emphasis on conversation and composition. Prerequisite: Ital 3 or equivalent. Laboratory fee, $35 per semester. (Spring)

9–10 **Oral and Written Italian** (3–3) Ferretti
Prerequisite: Ital 4 or equivalent and permission of instructor. (Academic year)

51–52 **Survey of Italian Literature** (3–3) Ferretti
Readings in Italian literature from the Middle Ages to the present. Lectures, reports, and informal discussions.

## PORTUGUESE

### First Group

1–2–3 **Introductory Portuguese** (4–4–4) Franklin
A three-semester course. Pronunciation, conversation, reading, composition, grammar. Laboratory fee, $35 per semester. (Port 1 and 3—fall; Port 2—spring)

4 **Civilization and Culture** (3) Franklin
A study of the history, geography, and culture of Brazil, with emphasis on conversation and composition. Prerequisite: Port 3 or equivalent. Laboratory fee, $35. (Spring)

9–10 **Oral and Written Portuguese** (3–3) Franklin
Acquisition of oral and writing skills requisite for effective communication. Prerequisite: Port 4 or equivalent. (Offered as the demand warrants)

## ROMANIAN

### First Group

49–50 **Readings in Romanian** (3–3) Staff
An introductory course that stresses the basic grammar of Romanian and concentrates on the development of reading skills. Knowledge of another Romance language is useful. (Offered as the demand warrants)

## SPANISH

**Departmental prerequisite:** Span 4 or equivalent is prerequisite to all courses in Spanish, from Span 9 and above.

### First Group

1–2–3 **Introductory Spanish** (4–4–4) Barnett and Staff
A three-semester course. Pronunciation, conversation, reading, composition, grammar. Laboratory fee, $35 per semester. (Fall, spring, and summer)

4 **Civilization and Culture** (3) Sáenz and Staff
A study of the history, geography, and culture of Spain, with emphasis on conversation and composition. Prerequisite: Span 3 or equivalent. Laboratory fee, $35. (Fall, spring, and summer)

9–10 **Oral and Written Spanish** (3–3) Azar and Staff
Acquisition of oral and writing skills requisite for effective communication. Prerequisite: Span 4 or equivalent. (Fall, spring, and summer)

20 **Prensa y Cultura: Intensive Spanish Conversation** (3) Azar
Intensive conversation organized around specific contemporary topics; illustrated by periodical material, films, and interviews.

49 **Spanish for Graduate Students** (0) Staff
For graduate students preparing for reading examinations. No academic credit. Tuition is charged at the rate of 3 credit hours, plus University Center fee. (Fall and spring)

51–52 **Survey of Spanish Literature** (3–3) Barnett
Survey of Spanish literature from the Middle Ages to the present. Lectures, reports, and informal discussions. (Academic year)

91–92 **Explicación de Textos** (3–3) Sáenz
Analytical introduction to Spanish and Spanish-American literature. Method demonstrated and practiced on selected passages. (Academic year)

**Second Group**

103 **Spanish Phonetics and Pronunciation** (3) Staff
Intensive study of the sound structure of Spanish. Elements of articulatory phonetics, phonetic symbolism, and transcription. Exercises in reading and conversation, with particular attention to the sound shape of vowels and consonants as well as stress, rhythm, and intonation. Prerequisite: oral proficiency in Spanish at the level of Span 10.

109–10 **Modern Spanish Syntax** (3–3) Sáenz
Systematic presentation of problems of Spanish syntax. Refinement of written and oral language skills through intensive study and practice of diction, stylistics, and composition. Prerequisite: Span 10 or equivalent. (Academic year)

119–20 **Medieval Spanish Literature** (3–3) Azar
Survey by genre of the literature of the Middle Ages.

121–22 **Spanish Literature of the Golden Age** (3–3) Azar
Span 121: Poetry and drama. Span 122: Prose.

123–24 **Cervantes: *Don Quijote*** (3–3) Azar
The *Quijote* and the novel as a literary genre: reality and fiction. (Academic year)

125–26 **Modern Spanish Literature** (3–3) Barnett
Prose, poetry, and drama of the 18th and 19th centuries. Class analysis of texts, collateral readings, lectures on literature and history. (Academic year)

127–28 **Contemporary Spanish Literature** (3–3) Sáenz
Prose, poetry, and drama of the 20th century. Class analysis of texts, collateral readings, lectures on literature and history.

133 **Seminar: Spanish Literature** (3) Sáenz
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs. (Fall and spring)

151–52 **The Spanish-American Novel** (3–3) Robb
Development of the novel in Spanish America. Lectures, collateral readings, and class analysis of texts.

155–56 **Spanish-American Literature to 1880** (3–3) Robb
Literature of Spanish America from the colonial period to the latter part of the 19th century. Lectures, collateral readings, reports, and class analysis of important works. (Academic year)

157–58 **Spanish-American Literature Since 1880** (3–3) Robb
Literature of Spanish America from 1880 to the contemporary period. Lectures, collateral readings, reports, and class analysis of important works.

199–200 **Proseminar: Readings for the Major in Hispanic Language and Literatures** (3–3) Barnett
Required of all majors. Conferences and group discussions. (Academic year)

**Third Group**

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

## ROMANCE LITERATURES

**Third Group**

270 **Seminar: Literary History** (3) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

271 **Seminar: Literary Criticism** (3) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

272 **Seminar: Literary Theory** (3) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

273 **Seminar: History of the Language/Linguistics** (3) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

**Fourth Group**

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301–14. Students wishing to register for these courses should consult the chairman of the Department of Romance Languages and Literatures.

301–14 **Folger Institute Seminars** (3 each) Staff
Topics will be announced in the *Schedule of Classes*. May be repeated for credit provided the topic differs.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit.
(Fall and spring)

## RUSSIAN AND EAST EUROPEAN STUDIES—GRADUATE PROGRAM

**Program Committee:** S.L. Wolchik *(Director)*, M.A. Atkin, C.F. Elliott, C.A. Linden, C.A. Moser, Y. Olkhovsky, J. Pelzman, M.J. Sodaro, R. Thornton

*Master of Arts in the field of Russian and East European studies*—Offered by the School of International Affairs, this multidisciplinary program gives students a broad grasp of the history, politics, economics, culture, and language of Russia and East Europe.

Prerequisite: the admission requirements stated under the School of International Affairs. Before acceptance into the program, all students must show evidence of satisfactory completion of two years of Russian language study. In order to fulfill the language requirement, a student must demonstrate either limited working proficiency in reading and speaking Russian (1LR S2/R2) or professional proficiency in reading Russian (1LR R3). This almost always requires additional Russian language study. Credit for language study is not counted toward degree requirements.

Required: the general requirements stated under the School of International Affairs. The program consists of either a 30-semester-hour option with a thesis or a 36-semester-hour option without a thesis. All students must take three courses in the required core field of Soviet internal and external affairs. Those in the 30-hour program prepare for two additional fields, while those in the 36-hour program prepare for three additional fields

Master's Comprehensive Examinations must be passed in each of the fields for which the student has prepared.

All students are expected to have background preparation of at least two courses in Russian history and one course in either Soviet government and politics or Soviet foreign policy. If any of the background courses are lacking, equivalent courses must be taken for graduate credit and can be counted toward degree requirements.

Of the three courses taken in the required core field, one must be in Soviet internal affairs and one in Soviet external affairs. Courses that satisfy the internal affairs requirement are Hist 246, PSc/Hist 258, PSc/Hist 232, and PSc 266 and 267. Courses that satisfy the external affairs requirement are Hist 255 and PSc 263 and 268. Students in the nonthesis program must prepare for a field in East European history or politics; those in the thesis program must take at least one course in East European history or politics.

Other fields in Russian and East European affairs are as follows. (1) Soviet and East European economics (Econ 267, 268, 367). (2) Ideology and political thought (PSc 207, 208). (3) Russian literature and culture (Slav 161–62, 165, 166). (4) Soviet military policy and strategy (Hist 135, 255–56; PSc 269). (5) Modern Russian history (Hist 217, 218, 246). (6) Comparative and international aspects of Communism (PSc/Hist 232, PSc 270). (7) East European history (Hist 205, 206). (8) East European government and politics (PSc 264, 265). (9) Advanced Soviet government, politics, and policy (PSc 267 is required; other courses are PSc 263, 266, 268, 292; Hist 253–54, 259–60; Hist/PSc 258; Geog 265).

*Concentration in Russian literature and culture*—Students may choose either the thesis or nonthesis option. They must take the required core field in Soviet internal and external affairs in addition to selected fields as follows. (1) Nineteenth-century Russian literature (Slav 128, 141, 142, 152, 156, 186, 225, 254, 257). (2) Soviet literature (Slav 151, 165, 166, 186, 255). (3) Russian culture (Slav 161–62).

## SANSKRIT

See **Germanic Languages and Literatures.**

## SCIENCE, TECHNOLOGY, AND PUBLIC POLICY—GRADUATE PROGRAM

**Program Committee:** J.M. Logsdon *(Director)*, J.F. Coates, V.T. Coates, H.R. Nau, R.W. Rycroft, M.B. Wallerstein

*Master of Arts in the field of science, technology, and public policy*—The School of International Affairs offers an interdisciplinary program that focuses on interactions among scientific development, technological change, and governmental activities at the domestic and international levels. The program is planned to train individuals to understand and manage issues of science and technology policy.

Prerequisite: the admission requirements stated under the School of International Affairs Required: the general requirements stated under the School of International Affairs. The program consists of 36 semester hours, which may include 6 hours of thesis research. Students must pass Master's Comprehensive Examinations in three fields, including science, technology, and public policy (PSc 222, 223, 252, and an elective approved by the advisor), public policy and analysis (a minimum of a two-course sequence chosen from Econ 211, 212, PSc 203, 204; PSc 253, 254; PAd 260, 261, or PAd 295, 296), and an elective field (a minimum of two courses, which may be a field offered in another School of International Affairs program, a field in an academic department, or a field in a specific issue area such as space policy, trade policy, or environmental policy).

Students must demonstrate basic familiarity with concepts of economic theory, either by having taken prior course work beyond the introductory level or by taking Econ 217–18. Students must also satisfy a tool requirement in statistics or applied statistical methods, usually by successful completion of PAd 296 or Stat 105, 112, 183, or 197. In some cases, proficiency in a foreign language may be judged integral to the student's program of study; proficiency consists of reading knowledge as certified by the appropriate language department and will satisfy the tool requirement. Courses taken to fulfill the tool requirement may not be included in the 36 semester hours required for the degree.

equivalent degree. A student planning a concentration in Russian language must pass
Russian language entrance examination and must have a general knowledge of Russia
literature and an acquaintance with Russian history and culture. A student planning
concentration in Russian literature must have a general knowledge of Russian literature
an acquaintance with Russian history and culture, and a general proficiency in th
Russian language, as demonstrated by passing a Russian language entrance examination

Required: the general requirements stated under the Graduate School of Arts an
Sciences. All candidates must pass a reading knowledge examination in French, German
or a Slavic language other than Russian; a Russian language proficiency examinatio
upon completion of 15 semester hours of course work; and a Master's Comprehensiv
Examination. Additional specific requirements are as follows:

*Concentration in Russian language:* 24 semester hours of approved course work plus
thesis (equivalent to 6 semester hours) or 30 semester hours of approved course wor
without a thesis. The following courses are acceptable for the satisfaction of thes
requirements: Slav 152, 186, 211, 212–13, 215, 218, 220, 225, 241, 242, 257, 290, 295, an
Slav 101–2, 103, with a translation project in consultation with a faculty member.

*Concentration in Russian literature:* 24 semester hours of approved course work plus
thesis (equivalent to 6 semester hours) or 30 semester hours of approved course wor
without a thesis. Courses must include Slav 212–13 and at least 18 hours of literature

**Placement Examination:** A student who has not been granted advanced standing an
who wishes to continue in college the language begun in high school must tak
placement examination before registration. Upon completion of the examination, assign
ment is made to the appropriate course.

**First Group**

Mill

1–2 **First-Year Russian** (3–3)
First part of beginning course in fundamentals of speaking, understandi
reading, and writing Russian. Slav 1 is prerequisite to Slav 2. Laboratory fe
$35 per semester. (Academic year)

Mi

3–4 **Second-Year Russian** (3–3)
Second half of beginning course in fundamentals of speaking, understandin
reading, and writing Russian. Prerequisite to Slav 3: Slav 1–2 or two years
high school Russian. Prerequisite to Slav 4: Slav 3. Laboratory fee, $35 p
semester. (Academic year)

Thompson and S

5–6 **Intensive Beginning Russian** (6–6)
Classroom (7 hours), laboratory (1 hour). Beginning intensive course
fundamentals of speaking, understanding, reading, and writing Russ
(equivalent to Slav 1–2 and 3–4). Prerequisite to Slav 6: Slav 2 or
Laboratory fee, $35 per semester. (Academic year)

Miller, Thompson, Ra

9–10 **Third-Year Russian** (3–3 or 6–6)
Practice in speaking, listening, reading, and writing at the intermediate le
Prerequisite: Slav 4, 6, or permission of instructor. Students receive 3 cre
each semester unless they elect to take the course on an intensive basis
which 6 credits can be earned, with an additional three hours per week
practice in language skills. (Academic year)

31–32 **Elementary Polish** (3–3)
Beginning course in fundamentals of speaking, understanding, reading,
writing Polish. Prerequisite to Slav 32: Slav 31 or equivalent. Laboratory
$35 per semester. (Offered when the demand warrants)

41–42 **Elementary Serbo-Croatian** (3–3)
Beginning course in fundamentals of speaking, understanding, reading,
writing Serbo-Croatian. Prerequisite to Slav 42: Slav 41 or equivalent.
(Offered when the demand warrants)

47 **Beginning Russian for Reading** (3)
For undergraduate and graduate students with little or no Russian who
to acquire an elementary reading knowledge of the language. No credit
credit for graduate students. (Summer)

49 **Russian Reading** (3) Staff
Primarily for graduate students preparing for reading examinations. No academic credit for graduate students. Prerequisite: Slav 47 or equivalent. (Summer)

51–52 **Elementary Bulgarian** (3–3) Moser
Beginning course in fundamentals of speaking, understanding, reading, and writing Bulgarian. Prerequisite to Slav 52: Slav 51 or equivalent. Laboratory fee, $35 per semester. (Offered when the demand warrants)

71 **Soviet Civilization** (3) Olkhovsky
Survey of the Soviet Union's past and present development. Lectures, discussion, visual aids—in English. (Fall)

91–92 **Introduction to Russian Literature** (3–3) Moser
Emergence and development of Russian literature and ideas during the 19th and early 20th centuries—in English. (Academic year)

**Second Group**

101–2 **Readings in the Soviet Press** (3–3) Ficks
Representative reading and translation of Soviet periodicals and current publications in social sciences. Prerequisite: Slav 4, 6, 49, or permission of instructor.

109–10 **Fourth-Year Russian** (3–3) Staff
Practice in speaking, listening, reading, and writing at the intermediate and advanced levels. Prerequisite: Slav 10 or permission of instructor. (Academic year)

128 **Dostoevsky: The Man and the Artist** (3) Natov
Sources and development of Dostoevsky's philosophical, religious, and aesthetic ideas. His influence on Russian and western literature. Lectures, discussions, and reports—in English.

141 **Readings in 19th-Century Russian Prose** (3) Staff
Reading of representative prose texts of the 19th century—in Russian. Prerequisite: Slav 10 or equivalent. (Fall, even years)

142 **Readings in 19th-Century Russian Poetry** (3) Staff
Reading of representative lyric poetry of the 19th century—in Russian. Prerequisite: Slav 10 or equivalent. (Spring, odd years)

151 **Readings in 20th-Century Prose and Poetry** (3) Staff
Reading and discussion of representative prose and poetry of the 20th century—in Russian. Prerequisite: Slav 10 or equivalent. (Fall, odd years)

152 **Russian Drama** (3) Natov
Readings of the most representative plays of the 19th and 20th centuries. Reports and class discussion—in Russian. Prerequisite: Slav 10 or equivalent. (Spring, even years)

158 **Leo Tolstoy: His Life and Works** (3) Staff
Evolution of Tolstoy's artistic and philosophical ideas. Tolstoy's impact on Russian literature and society. Lectures, reports, and classroom analysis of his major works—in English.

161–62 **Russian Culture** (3–3) Olkhovsky
Survey of Russian cultural heritage from origins of ancient Russia to present—in English. Lectures, discussion, reports.

165 **Modern Russian Literature from the Revolution to World War II** (3) Natov
Basic themes, trends, and literary figures of the 1920s and 1930s. The impact of the revolution and civil war on writers and literature. Lectures, discussions, reports—in English.

166 **Modern Russian Literature from World War II to the Present** (3) Natov
Literature in wartime and in postwar years. The "thaws," new generation of writers, and new trends in literature of the 1960s, 1970s, and 1980s. Lectures, discussions, reports—in English.

186 **The Russian Short Story** (3)
Development of the Russian short story since 1800. Lectures, reports, and class discussion—in Russian. Prerequisite: Slav 9–10 or equivalent. (Spring, odd years)

199–200 **Proseminar: Readings for the Major** (3–3)
Conferences and group discussions. (Academic year)

**Third Group**

211 **Russian Phonetics** (3)
Analysis of the sound system of standard contemporary Russian. An appropriate knowledge of Russian is required.

212–13 **Russian Structure** (3–3)
Linguistic analysis of standard contemporary Russian. Lectures, discussion, independent research —in Russian. (Fall)

214 **Methodology of Teaching Russian** (3)
Survey of modern methods, techniques, and materials for teaching Russian as a foreign language. Examination of textbooks, classroom observation, practice teaching. Prerequisite: advanced proficiency (ACTFL–ETS) in Russian.

215 **Russian Historical Grammar** (3)
An analysis of the historical development of Russian phonology, morphology, and syntax. An appropriate knowledge of Russian is required. (Fall, odd years)

218 **History of the Russian Literary Language** (3)
The development of the norms of the Russian literary language from earliest times to the present. An appropriate knowledge of Russian is required (Spring, even years)

220 **Russian Stylistics** (3)
Analysis of various styles of contemporary Russian from the point of view of vocabulary and structure—in Russian. (Spring, odd years)

224 **Russian Literature to 1800** (3)
Survey of Russian literature from the earliest times to the end of the 18th century. Appropriate knowledge of Russian required.

225 **Pushkin and the Poets of his Time** (3)
Pushkin's predecessors; Pushkin's poetry and drama; Lermontov, the heir to Pushkin's poetic tradition—in Russian. (Fall, odd years)

241 **Russian–English Oral Translation** (3)
Practice in oral translation from Russian into English. Prerequisite: Slav 109–10 or equivalent.

242 **Advanced Spoken Russian** (3)
Advanced practice in the spoken Russian language. Prerequisite: Slav 109–10 or equivalent.

254 **Seminar: Literary and Intellectual Currents of the 1860s** (3)
Discussion of literary and intellectual developments in Russia of the 1860s. Appropriate knowledge of Russian required. (Spring, odd years)

255 **Seminar: Main Trends in 20th-Century Russian Literature** (3)
Study of representative works since 1900; their artistic and social value. Russian. (Spring, even years)

257 **Seminar: The 19th-Century Novel** (3)
Reading and analysis of selected examples of the Russian novel of the 19th century (Dostoevsky, Tolstoy, Turgenev)—in Russian. (Fall, even years)

290 **Special Topics in Russian** (3)
Topics in Russian literature or linguistics. May be repeated for credit.

295 **Independent Reading and Research** (arr.)
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)
(Fall and spring)

## SOCIOLOGY

University Professor A. Etzioni
Professors R.W. Stephens, R.G. Brown, T.F. Courtless, Jr., P.H.M. Lengermann, R.A. Wallace, P. Langton, W.J. Chambliss *(Chair)*
Associate Professor J.L. Tropea
Assistant Professor S.A. Tuch

*Bachelor of Arts with a major in sociology (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite course—Soc 1.
3. Required courses in related areas—12 semester hours in one of the following related social science fields: anthropology, economics, geography, history, political science, or psychology.
4. Required courses in the major—Soc 103, 140–41, 191, and 15 additional semester hours in second-group sociology courses. Soc 101 and 102 are strongly recommended.

*Bachelor of Arts with a major in criminal justice (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students must consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)
2. Prerequisite course—Soc 1.
3. Required courses in related areas—Anth 156, Phil 142, PSc 115, and Psyc 130 and 154.
4. Required courses in the major—Soc 3, 135, 136, 137, 139, 151, plus three additional second-group sociology courses.

*Minor in sociology*—A minimum of 15 hours of course work, including Soc 1 and one course chosen from Soc 101, 102, 103, and 140, plus 6 hours of electives in courses at the 100 level or higher. Departmental advising is required.

*Master of Arts in the field of sociology*—Prerequisite: a bachelor's degree with a major in sociology or in an approved related field.

Required: the general requirements stated under the Graduate School of Arts and Sciences. With the approval of the advisor and of the Admissions Advising Committee, students may elect one of the following programs: (1) at least 24 semester hours of graduate work plus a thesis (equivalent to 6 semester hours), satisfactory completion of a Master's Comprehensive Examination in either sociological theory or social research methods, and an oral presentation of the completed thesis; or (2) at least 33 semester hours of graduate course work and satisfactory completion of a Master's Comprehensive Examination in either sociological theory or social research methods, and one substantive special field (criminology/sociology of law, gender, medical sociology health policy, race and ethnicity, and theory). Six semester hours may be taken outside the department.

In addition to the hours specified above, all candidates must satisfactorily complete Stat 105 or its equivalent. Candidates must select from the graduate sociology courses as follows: 6 hours chosen from sociological theory (Soc 238 and 239), 6 hours of social research methods (Soc 230 and 232), and 6 hours chosen from one area of specialization (criminology/sociology of law, gender, medical sociology health policy, race and ethnicity, and theory).

*Doctor of Philosophy in the field of sociology*—Required: the general requirements stated under the Graduate School of Arts and Sciences. Students must complete 24 to 30 semester hours of graduate course work, 6 to 10 hours of specialized research, and 12 to 18 hours of dissertation research, for a total of 48 hours beyond the master's degree. Students must include in their program of study at least 3 hours of course work in sociological theory (either Soc 338 or 339); 6 hours in research methods (Soc 231 and a qualitative methodology course selected from the following: Soc 332, Educ 282, Phil 255, AmCv/Anth/Hist 197, WStu 221, Anth 200).

Students must satisfactorily complete the General Examination in either sociological theory or social research methods and one substantive area of specialization.

**Departmental prerequisite:** Soc 1 is prerequisite to all sociology courses except Soc 3 and 181.

**First Group**

1 **Introductory Sociology** (3) Staff
General principles of sociology: development of culture and personality, impact of groups and institutions on social behavior. (Fall and spring)

2 **Major Social Issues** (3) Staff
Critical examination of selected social issues in contemporary American society. (Fall and spring)

3 **Introduction to Criminal Justice** (3) Chambliss, Courtless, Tropea
An introduction to the study of criminal justice. The historical development of criminal justice and its evolution into modern legal systems. The impact of different forms of criminal justice on society and the individual. (Fall and spring)

**Second Group**

101 **Development of Social Thought** (3) Lengermann
An exploration of the emergence and growth of sociology from 1800 to 1930, with emphasis on the elaboration of sociological concepts and theories. (Fall)

102 **Modern Sociological Theory** (3) Wallace, Lengermann
Systematic study of contemporary schools of sociological theory, both European and American; evaluation of scientific contributions of each school. (Spring)

103 **Major Sociological Perspectives** (3) Lengermann, Wallace
An examination of the development and contemporary content of the major theoretical perspectives guiding sociological work. Theories include functionalism, exchange theory, critical theory, conflict theory, symbolic interactionism, and phenomenology. (Fall and spring)

120 **Sociology and Public Policy** (3) Staff
Introduction to concepts, theory, and research illustrating the application of the sociological perspective to public policy.

122 **Selected Cases in Policy Analysis** (3) Staff
Sociological analysis of topical issues in public policy (e.g., education, health, energy, welfare).

124 **Sociology of Health and Illness** (3) Langton, Bird
Social factors and processes related to the etiology and treatment of physical and mental illness; medical occupations and professions, medical organizations, problems of delivery of health care services. (Fall)

125 **Sociology of Religion** (3) Wallace, Yee
An analysis of the relationships between religion and society. Topics include the emergence of uniquely American religious forms such as civil religion and cultic groups. (Fall, odd years)

126 **Urban Sociology** (3) Staff
The sociological dynamics of the city and of urban growth in the United States: urban conflict, class conflict, and racism; problems of urban society, crime and deviance, political competition, and revolt. (Fall) Langton

127 **Population Problems** (3)
Composition of populations, trends in population growth and population pressure, factors producing population movements, effects of migration, population policies—eugenics and birth control. (Fall)

129 **Race and Minority Relations** (3) Stephens, Tuch
Analysis of relationships between dominant and minority groups in society, particularly in the United States; nature and range of problems; analysis of the phenomenon of prejudice. (Spring)

130 **Class and Inequality in American Society** (3) Tuch, Brown
Analysis of distribution of resources and opportunities for participation, education, and social mobility in American society; international comparisons; analysis of public policies that affect these distributions. (Fall)

132 **The Family in Modern Society** (3) Stephens
An examination of the stages of family life: birth, childhood, premarital relationships, marriage and sex roles in marriage, retirement and old age. Special emphasis on development and maintenance of interpersonal relations. (Fall)

133 **Learning and the Life Cycle** (3) Tropea, Wallace
Sociological approaches to learning from childhood through adolescence and adulthood. Emphasis on the impact of social institutions and group interaction on the learning process. (Spring)

134 **Violence and the Family** (3) Tropea
A criminal justice course. Comparative approach to power and violence in family systems. Analysis of devaluation of family relations. Critical survey of explanations of violence and responses made to it. (Fall)

135 **Youth and Delinquency** (3) Chambliss, Courtless, Tropea
A criminal justice course. Analysis of historical, economic, and social conditions affecting both difficulties in socializing youth and the evolution of the state's formal systems of control. (Spring)

136 **Criminology** (3) Chambliss, Tropea, Courtless
Nature and distribution of crime as related to the development and operation of criminal law and various social and legal institutions in urban society. Analysis of the historical, social, legal, and cultural conditions affecting the nature of crime, criminality, and the development of state responses made to it. (Fall)

137 **Sociology of Law** (3) Chambliss, Courtless, Tropea
A criminal justice course. Law as a social phenomenon and agency of social control. Special emphasis is placed on study of the sources of and challenges to the legitimacy of law. (Fall)

138 **Alcohol, Alcoholism, and Society** (3) Langton
An overview of alcohol use and abuse in American society: impact on work, family, and crime; policies and legislation for social control of problem drinking and alcoholism. (Spring)

139 **Deviance and Control** (3) Chambliss, Tropea, Courtless
A criminal justice course. Analysis of the creation of deviance through collective definitions and responses. Development of a perspective on processes of becoming deviant. (Spring)

140 **Social Research Methods** (3) Tuch
Introduction to basic research methods in sociology. Topics include research design, sampling, measurement, and elementary data analysis via computer application. (Fall)

141 **Advanced Research Methods** (3) Tuch
Continuation of Soc 140. Examination of a range of topics in the statistical analysis of sociological data, with a strong emphasis on computer applications. Prerequisite: Soc 140. (Spring)

143 **Social Movements** (3) Stephens
General survey of the various forms of collective behavior (fads, panics, riots, social movements, etc.), and a more detailed study of the genesis, development, and decay of social movements and social revolutions. (Spring)

151 **Field Experience in Criminal Justice** (9) Courtless, Tropea
Experientially based learning of the administration of justice through field placements in legislative and policymaking domains and in institutions of

juvenile and criminal justice. Academic evaluation predicated on independent readings, research, journals, and seminar participation. Sixteen hours of field work and four hours of seminar required weekly. Admission by permission of criminal justice advisors. (Fall, spring, and summer) Staff

152 **Field Experience in Sociology** (9)
Development of a comprehensive perspective and applied skills in selected social systems through seminars, readings, research, and field placement. Requires 16 hours of field work weekly. Recommended for juniors and seniors. Open to all but majors in criminal justice. Topics include health, aging, and family. (Fall or spring)

155 **Sociology of Sex and Gender** (3) Wallace, Lengermann
The roles of women and men from social structural and social psychological perspectives. Analysis of gender inequality in such areas as the family, the workforce, the media, politics, law, religion, and education. (Fall)

160 **Death and Dying: A Sociological Perspective** (3) Brown, Langton
Processes of death and dying examined from the perspectives of dying persons, their families and professionals. Death as a social institution and various social issues surrounding death, such as suicide, euthanasia, capital punishment, and death-related social movements, are analyzed. (Spring) Staff

181 **Major Social Processes** (3)
Analysis and examination of various processes in society of general importance to the field of sociology, e.g., social conflict, socialization, social change. Topic changes each semester; may be repeated for credit. Admission by permission of instructor. (Fall) Staff

191 **Current Emphases in Sociology** (3)
Analysis and evaluation of recent developments in the general field of sociology. Required for all sociology majors. (Fall) Staff

195 **Research** (1, 2, or 3)
Independent study and special projects. Open only to selected undergraduate students with promising academic records. Before students are permitted to register for Soc 195, they must submit a written proposal of their plan of study for the approval of the staff member of the department who will be directing the research. (Fall and spring)

**Third Group** Staff

203 **Social Organization** (3)
Introduction to sociological concepts and perspectives. An examination of empirical studies that utilize different theoretical perspectives. Recommended for students offering sociology as a supporting field. (Fall)

210 **Theoretical Foundations of Political Sociology** (3) Lengermann
Sociological theory on the relationship of politics to the wider social system. Emphasis on concepts of power, alienation, ideology, political stability, conflict, and change.

220 **Seminar: Sociology of Religion** (3) Wallace, York
Analysis of theoretical and empirical approaches to the study of religion as a social phenomenon. Both classical and contemporary contributions will be examined. Among the topics are secularization, new religious movements, and modes of religious organization. (Spring, even years)

225 **Theories of Social Change** (3) Lengermann
Review of sociological writings on modernity—its emergence in the North Atlantic societies, its consequences for third world societies, and its future. (Spring) Ta

230 **Sociological Research Methods** (3)
Systematic survey of sociological research strategies and review of literature in this area. Recommended for students with only one undergraduate course in research techniques. Prerequisite: Stat 105 or equivalent. Ta

231 **Seminar: Advanced Research Methods** (3)
Intensive study and evaluation of a few sophisticated research techniques

and of new developments in the methodology of social research. Prerequisite: Soc 230. (Spring)

232 **Qualitative Methodology: Doing Field Research** (3) Langton
Practical application of data collection methods in natural settings; observation, participant observation, and field experience. Emphasis on implementing research projects by using these methods for purposes of developing empirically grounded theory.

235 **Seminar: Sociology of Education** (3) Wallace, Tropea
Sociological theories on relationships between education and the economic, political, social, and cultural character of society; examination of social factors relating to such topics as educational achievement, the changing functions of educational structures, and the roles of teacher and student. (Spring, odd years)

238 **Seminar: Development of Sociological Theory** (3) Lengermann
Development of sociology from the early 1800s to the 1920s. Intensive analysis of the classical theoretical statements. (Fall)

239 **Seminar: Modern Sociological Theory** (3) Lengermann, Wallace
Intensive examination and evaluation of contemporary schools of sociological theory in Europe and America. Advanced analysis of theoretical perspectives. Prerequisite: Soc 238. (Spring)

240 **Sociology of Work and Occupations** (3) Langton
Review of major theoretical and empirical developments in industrial sociology; varying approaches to the study of work and occupations. (Fall)

241 **Sociology of Work and Organizations** (3) Langton
Theory of complex organizations relative to work in industry, government, and business; examination of basic processes such as decision making, recruitment, allocation of authority, informal organization, and interorganizational relations. (Spring)

242 **Seminar: Sociology of Health and Illness** (3) Langton
Study of the social structure of health care and the interplay of the various health professions; examination of social factors and processes related to the etiology and treatment of illnesses. (Fall)

245 **Seminar: Race Relations** (3) Tuch
Systematic analysis of race relations and inequality, primarily in the United States. Topics include current status and recent trends in inequality, the institutional and organizational patterning of discrimination, the structure of white racial attitudes, theoretical perspectives on race relations, and selected policy issues. (Spring)

254 **Evaluative Research** (3) Staff
Systematic survey of conceptualization, design, and practice of evaluative research of social experiments and of simulation and technological forecasting. (Spring, even years)

256 **Selected Topics in Social Policy Analysis** (3) Staff
A sociological perspective on selected policy areas, including urban planning, education, family, aging, health, affirmative action, law enforcement, and economic development. Particular policy areas will be rotated year by year. Course may be repeated for credit.

*259 **Law and Criminology I: Search for the Causes of Criminal Behavior** (3) Chambliss, Courtless, Tropea
Same as Law 478(2). (Fall)

*261 **Law and Criminology II: Society's Responses to the Criminal Offender** (3) Chambliss, Courtless, Tropea
Same as Law 479(2). (Spring)

* Students registering for Soc 259 or 261 make special arrangements with the instructor for supplementary assignments equivalent to 1 additional semester hour. For description of the courses, see the National Law Center Bulletin

263 **Seminar: Law and Society** (3) Chambliss, Courtless
Selected problems in law as an instrument of social policy; emphasis on the organization of legal decision-making processes. (Summer)

265 **Selected Topics in Criminal and Juvenile Justice Policy** (3) Chambliss, Courtless, Tropea
Development of a systematic perspective on policies affecting the juvenile and criminal justice systems. Topics will include adjudication, disposition, diversion, and sentencing. (Spring, even years)

270 **Seminar: Foundations of Social Inequality** (3) Stephens
Review of the principal concepts and theories used to explain social inequality at both macro and micro levels. Examination of principal bases of inequality and their representative forms. (Prerequisite course for students selecting social inequality as a major field.) (Fall)

271 **Seminar: Gender and Society** (3) Lengermann, Wallace
An examination of quantitative and qualitative research in the field of gender with emphasis on current empirical research. (Fall)

272 **Seminar: Theoretical Perspectives on Gender** (3) Lengermann, Wallace
Review of significant theoretical writings on gender and gender inequality with a primary focus on contemporary sociological statements. (Spring)

280 **The Sociology of Aging** (3) Brow
Impact of current demographic changes (size and composition of the population) on the existing structure of American society. (Spring)

281 **Problems of Growing Old in American Society** (3) Brow
Analysis of the bases of the social status of the aged in American society, the impact on older people of characteristic situational changes in later life, and societal responses to those impact areas defined as social problems. (Fall) Boulin

290 **Principles of Demography** (3) Boulin
Same as Econ/Geog/Stat 290.

291 **Methods of Demographic Analysis** (3) Stat
Same as Econ/Geog/Stat 291.

295 **Research** (arr.)
Independent study and special projects. Before permission is granted to register for Soc 295, the student must submit a written plan of study for the approval of the staff member of the department who will be directing the research. May be repeated once for credit. (Fall and spring) Staff

299-300 **Thesis Research** (3–3)
(Fall and spring)

**Fourth Group**

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. Other graduate students are permitted at the discretion of the department or the instructor.

332 **Seminar: Processes of Inquiry** (3) Staff
Development and critical review of students' research projects with the objectives of aiding conceptualization and developing research design. Consideration of the interplay between theory and methods. Prerequisite: at least 3 semester hours each of graduate theory and graduate methods. May be repeated for credit.

338 **Advanced Seminar: Classical Sociological Theory** (3) Chambliss, Lengermann, Wallace
Intensive investigation of special topics in classical sociological theory. Prerequisite: Soc. 238 and 239. (Spring)

339 **Advanced Seminar: Modern Sociological Theory** (3) Chambliss, Lengermann, Wallace
Intensive investigation of special topics in modern sociological theory. Prerequisite: Soc 238 and 239. (Fall)

342 **Advanced Seminar on Health Policy** (3) Lasl
Review of how health policy is made and implemented; how health pro-

research is done: in-depth review of selected topics and completed policy studies, primarily for students in the medical/health policy field. Prerequisite: Econ 248, Soc 242 or consent of the instructor. (Spring)

351 **Selected Topics in Sociology** (3) Staff
Intensive investigation of special topics in sociological theory. May be repeated for credit. (Fall)

352 **Selected Topics in Sociology** (3) Staff
Intensive investigation of special topics in sociological research. May be repeated for credit. (Spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## SPANISH

See **Romance Languages and Literatures.**

## SPEECH AND HEARING

Professors J.W. Hillis, L.S. Bowling, G.R. Herer, C.W. Linebaugh *(Chair)*
Associate Professors M.D.M. Brewer, J.R. Regnell
Assistant Professor S.L. Murray

*Bachelor of Arts with a major in speech and hearing science (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses—Comm 1, SpHr 11.
3. Required courses in related areas—Psyc 121 and 131 (or their equivalent), plus 15 additional semester hours of second-group courses selected from related areas as approved by the major advisor.
4. Required courses in the major—SpHr 101, 102, 103, 104, 108, 118, 119, 120.

*Minor in speech and hearing*—15 semester hours are required, including SpHr 11, 101, 103, and at least 6 semester hours of second-group courses to be selected from SpHr 102, 104, 108, 118, 119, and 120.

*Master of Arts in the field of speech–language pathology and audiology*—Prerequisite: the degree of Bachelor of Arts with a major in speech and hearing science from this University, or an equivalent degree, and an appropriate score on the Aptitude Test of the Graduate Record Examination.

Required: the general requirements stated under the Graduate School of Arts and Sciences. The program of study consists of 36 semester hours of approved course work without a thesis or, with the approval of the department, 24 semester hours of approved course work plus a thesis (equivalent to 6 semester hours). All students must satisfy the academic and supervised practicum requirements of the Certificate of Clinical Competence awarded by the American Speech-Language-Hearing Association.

All students must take the National Examination in Audiology or in Speech Pathology available through the Educational Testing Service. Students must request the Testing Service to send copies of the test scores to the Department of Speech and Hearing to be used in the fulfillment of the general requirement in the Graduate School of Arts and Sciences for the Master's Comprehensive Examination. Satisfactory test results must reach the department at least three weeks before graduation. In the event that the National Examination is not available, the Speech and Hearing Department may substitute its own examination.

**Speech and Hearing Therapy**: See the Speech and Hearing Center.

**First Group**

11 **Voice and Diction** (3) Regnell, Bowling
Development of naturalness, correctness, and clarity in conversation through the study of phonetics, rate, volume, pitch, and quality in preparation for performance. Recording fee, $5. (Fall, spring, and summer)

**Second Group**

101 **Bioacoustics** (3) Brewer
Basic acoustics, psychoacoustics, acoustic analysis of speech, and acoustic phonetics. Theories of auditory processing and speech perception. (Spring)

102 **Neural Substrates of Speech, Hearing, and Language** (3) Linebaugh
Neuroanatomy and neurophysiology as they relate to speech, hearing, and language. Emphasis on sensory and motor systems and neuroanatomical correlates of language processing; neurolinguistics. (Spring)

103 **Anatomy and Physiology of the Speech and Hearing Mechanism** (3) Linebaugh
Functions of the respiratory, laryngeal, and orofacial structures in normal speech production; physiological phonetics. Biomechanical aspects of hearing and theories of frequency and intensity analysis by the peripheral auditory mechanism. (Fall)

104 **Speech and Language Disorders** (3) Regnel
Survey of the nature and causes of developmental and acquired disorders of speech and language. Emphasis on prevention and effective communication with persons having a speech–language impairment. (Spring)

108 **Introduction to Audiology** (3) Brewer
Survey of the field of audiology, including the measurement of hearing, the nature and causes of hearing impairment, hearing aids and habilitation rehabilitation of the hearing impaired. Prerequisite: SpHr 101. (Spring

118 **Structure and Development of Speech and Language** (3) Staff
Semantic, morphologic, syntactic, phonologic, and pragmatic aspects of language. Development of speech, language, auditory, and related cognitive processes from birth to adolescence. (Fall)

119 **Experimental Analysis of Communication Behavior** (3) Hills
Observation and measurement of speaker–listener performance. Review of literature on assessment of speaker–listener behavior; study of acoustic, behavioral, and linguistic properties of speaker intelligibility and credibility; application of behavioral observation and computer technology in identification, measurement, and modification of speaker–listener attributes. Students desiring laboratory credit for this course may register additionally for one semester hour of SpHr 196. Prerequisite: Comm 1 or SpHr 11. (Fall)

120 **Analytic Procedures for Speech and Language** (3) Staff
Methods for the semantic, syntactic, and phonologic analysis of oral language samples. Practice in phonetic/phonemic transcription and syntactic analysis. Prerequisite: SpHr 118 or equivalent. (Spring)

196 **Independent Study** (1 to 6) Staff
Independent research and special projects. Before students are permitted to register for SpHr 196, they must submit a written proposal of the plan of study and obtain approval of the staff member who will direct the study and of the department chair.

**Third Group**

267 **Industrial Audiology** (3) Bowlin
Theories and processes pertinent to communicative disorders related to industrial noise. Consideration of hearing conservation programs, environmental assessment, and relevant legislation. (Fall)

268 **Selected Topics in Clinical Audiology** (1 to 3) Bowling
Advanced study of selected theoretical and clinical issues. May be repeated, but may not be taken for more than a total of 3 semester hours of credit. (Fall, spring, and summer)

269 **Community Programs in Communication Disorders** (3) Herer
Methods and procedure for the planning, management, and operation of hospital, school, and other community programs for the communicatively impaired. (Fall)

270 **Pediatric Audiology** (3) Bowling
Embryologic development of the auditory mechanism. Nature and causes of auditory impairments; audiometric techniques used to measure hearing in children. Laboratory fee, $7.50. (Spring)

271 **Congenital Disorders of Speech Production** (3) Staff
Evaluation and treatment of infants and children with congenital speech disorders, including cerebral palsy and cleft palate. Emphasis on management of prespeech oral motor and feeding impairments. Laboratory fee, $7.50. (Summer)

272 **Disorders of Speech Articulation** (3) Staff
Nature and causes of developmental articulation disorders. Differential diagnosis and treatment of articulation disorders, including phonological impairment and developmental apraxia of speech. Laboratory fee, $7.50. (Fall)

273 **Pediatric Language Impairments: Identification and Diagnosis** (3) Murray
Review of current theoretical approaches to evaluation; differential diagnosis of developmental language delays and disorders; review of available standardized tests; observation and testing experience. Laboratory fee, $7.50. (Fall)

274 **Pediatric Language Impairments: Treatment** (3) Staff
Review of current therapeutic models, use of diagnostic information for designing a treatment plan; monitoring progress; coordinating language remediation with classroom and additional resource support; experience through monitoring ongoing language treatment. Laboratory fee, $7.50. (Spring)

275 **Evaluation and Treatment of Speech Fluency Disorders** (3) Hillis
Procedures for clinical assessment of stuttering and other disorders of speech rate and rhythm. Review of historical and current methods for treatment. Laboratory fee, $7.50. (Spring)

276 **Seminar: Speech Fluency Disorders** (3) Hillis
Consideration of stuttering and other disorders of speech rate and rhythm from developmental, linguistic, physiological, and psychosocial points of view. (Fall)

277 **Clinical Aphasiology** (3) Linebaugh
Current neurolinguistic theories. Differential diagnosis and clinical management of aphasia and communicative impairments resulting from right cerebral hemisphere damage, closed head injury, and dementia. Laboratory fee, $7.50. (Fall)

278 **Applied Neurolinguistics** (3) Linebaugh
Neurolinguistic and cognitive processes of language formulation and comprehension. Application of neurolinguistic models to neurogenic communicative disorders. (Summer)

279 **Motor Speech Disorders** (3) Linebaugh
Methods for assessing motor speech disorders and their physical, acoustic, and perceptual characteristics. Differential diagnosis and treatment of apraxia of speech, the dysarthrias, and dysphagia. Laboratory fee, $7.50. (Spring)

280 **Evaluation and Treatment of Voice Disorders** (3) Regnell
Normal anatomy and physiology of the human vocal mechanism. Nature, causes, and clinical management of functional and organic voice disorders, including laryngectomy. Laboratory fee, $7.50. (Fall)

281 **Seminar: Voice Disorders** (3) Regnell
Advanced study of selected theoretical and clinical issues regarding voice disorders. (Summer)

283 **Aural Rehabilitation** (3) Brewer
Habilitation/rehabilitation of the hearing impaired, including auditory training, speech reading, hearing aids, assistive listening devices, communication strategies, and counseling. Laboratory fee, $7.50. (Fall)

284 **Clinical Audiology I** (3) Brewer
Psychoacoustic principles and methods underlying the assessment of auditory disorders. Anatomy and physiology of the auditory mechanism. Laboratory fee, $7.50. (Fall)

285 **Hearing Aids** (3) Staff
Discussion of hearing-aid characteristics and electroacoustic measurements; hearing-aid effectiveness in improving communicative efficiency; procedures for selection and clinical evaluation of hearing aids; counseling of the patient. Laboratory fee, $7.50. (Spring)

286 **Electrophysiologic Assessment of Hearing** (3) Bowling
Study of electrophysiologic techniques used to assess cochlear and retrocochlear function. Theories and clinical applications of vestibular tests, auditory brainstem-evoked responses, and electrocochleography. Laboratory fee, $7.50. (Spring)

287 **Central Auditory Processes** (3) Bowling
Factors affecting auditory perception and comprehension. Identification and clinical management of central auditory processing disorders in children and adults. Laboratory fee, $7.50. (Fall)

288 **Psychoeducational Management of the Hearing Impaired** (3) Staff
Study of the psychosocial and educational effects of hearing loss. Assessment, remediation, and management approaches related to the education of the hearing impaired. Laboratory fee, $7.50. (Summer)

289 **Clinical Audiology II** (3) Staff
Audiological assessment of middle ear function, speech audiometry, and management of diagnostic information. Laboratory fee, $7.50. (Fall)

290 **Selected Topics in Developmental Language Disorders** (1 to 3) Staff
Advanced study of selected theoretical and clinical issues regarding developmental language disorders. May be repeated, but may not be taken for more than a total of 3 semester hours of credit. (Summer and fall)

292 **Research Methods in Speech and Hearing** (3) Hall
Methods for the design and execution of research in speech and hearing. Topics include hypothesis formulation, literature review, proposal preparation, data acquisition and analysis, and preparation of final research reports. Laboratory fee, $7.50. (Spring)

295 **Independent Research in Speech, Language, and Hearing** (arr.) Staff

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

## STATISTICS/COMPUTER AND INFORMATION SYSTEMS

*Professors* H.F. Bright *(Emeritus)*, S. Kullback *(Emeritus)*, H.W. Lilliefors, A.D. Kirwan, J.L. Gastwirth, S.W. Greenhouse, N.D. Singpurwalla, M. Halperin *(Research)*, S.S. Smythe *(Chair)*, J.M. Lachin III

*Professorial Lecturers* J. Kullback, K.M. Wolter, F. Ponti, N.J. Kirkendall, W.I. Smith, W.R. Nunn

*Associate Professors* R.E. Thomas, P.F. Thall, S.E.F. Schlesselman *(Research)*

*Associate Professorial Lecturers* R. Jacob, T.C. Teeples, R.F. Teitel, J.S. Wu

*Assistant Professors* R.P. Bain *(Research)*, R.E. Bunker, D.A. Grier, H.M. Mahmoud, T.K. Nayak

*Assistant Professorial Lecturers* A. Chu, C.W. Dyhouse

*Bachelor of Arts or Bachelor of Science with a major in statistics (departmental), statistics with an option in computer science (departmental), or computer and information systems (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Prerequisite courses for all majors—Math 31, 32, 33; Stat 91 (except computer and information systems majors).
3. Required courses for all majors—Math 124; Stat 129, 130.
4. (a) Required courses for the statistics major—Stat 118, 119, 157–58, 189, plus three approved second-group courses in statistics.

(b) Required courses for the statistics major with an option in computer science—Stat 118, 119, 131, 157–58, plus three approved second-group computer related courses. Math 105 is recommended.

(c) Required courses for the computer and information systems major—Stat 131, 132, 133, 134, 135, 142, 157–58 or 189–90, plus two approved courses from Stat 145, 146, 147, 148, 149, 150. Math 105 is recommended.

5. Students interested in eventually pursuing a Ph.D. program in statistics are advised to take Stat 190, Math 139 and 140, and two years of a foreign language. Math 157 is also recommended.
6. To assure a balanced program, departmental approval of electives is required for all majors.

Students who seek Special Honors in statistics should check with the Department.

*Minor in statistics*—18 hours of approved courses in this department, including an introductory statistics course, Stat 118, and one computer course.

*Minor in computer science*—18 hours of approved courses in this department, including Stat 129, 130, 131, and one course in statistical methods. A year of calculus is recommended.

*Master of Science in the field of applied statistics, Master of Science in the field of statistical computing,* or *Master of Arts in the field of mathematical statistics*—The program of study consists of 30 to 36 semester hours of course work without a thesis. In exceptional cases the department may approve a program of study consisting of 24 to 30 semester hours of course work plus a thesis, equivalent to 6 additional semester hours. Candidates must pass a written Master's Comprehensive Examination. For prerequisites and additional requirements, see below.

*Master of Science in the field of applied statistics*—Two options are provided: a general curriculum in applied statistics and a concentration in biostatistics. Prerequisite: Math 31, 32, 33, and 124; Stat 118 and 157–58. (Stat 157–58 is not required if Stat 201–2 is included in the program.)

Required: the general requirements stated under the Graduate School of Arts and Sciences and 30 to 36 semester hours of course work. If the student has not previously had Stat 119 or equivalent, the program must include Stat 221 or 217–18. Courses are selected in consultation with the advisor.

(a) *General curriculum in applied statistics*—The core curriculum includes Stat 201–2 and 210. An additional 21 semester hours must be chosen in consultation with the advisor.

(b) *Concentration in biostatistics*—The core curriculum includes Stat 187, 201–2, 210, 225–26, 227, 231. Twelve additional semester hours are electives of which 6 hours must be in statistics and 6 hours must be in health sciences or related areas. All electives must be approved by the advisor.

*Master of Science in the field of statistical computing*—Prerequisite: Math 31, 32, 33, and 124; Stat 118, 130, 131, and 132, or demonstrated proficiency in advanced programming techniques.

Required: the general requirements stated under the Graduate School of Arts and Sciences and 30 to 36 semester hours of course work. The 24-hour core consists of 201–2, 203, 204, 207–8, 210, and 283. Students entering the program without a strong background in statistics will be expected to take at least 3 semester hours of options in statistics.

*Master of Arts in the field of mathematical statistics*— Prerequisite: a bachelor's degree

with a major in statistics from this University, or an equivalent degree. If undergraduate study did not include equivalent required courses, those courses must be taken as prerequisite to graduate study. Additional prerequisites include Math 139 and 140. Under certain circumstances some prerequisites may be waived; check with the department.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including Stat 201-2 and 217-18. The remaining 18 semester hours must be selected in consultation with the advisor.

*Doctor of Philosophy in the field of statistics*—Prerequisite: A master's degree in statistics or a related discipline. The main requirement is a strong background in mathematics, including courses in advanced calculus, linear algebra, and mathematical statistics (similar to Stat 201–2). Some deficiencies may be made up concurrently during the student's first year. In some instances, a student may enter the Ph.D. program with a bachelor's degree.

Required: The general requirements stated under the Graduate School of Arts and Sciences, including satisfactory completion of (1) Stat 201–2, 217–18, 257, 258, 263, 264, and a minimum of 24 additional semester hours as determined by consultation with the departmental doctoral committee; (2) proficiency in computer languages as demonstrated by course work or an examination; (3) the General Examination, consisting of two parts: (a) a written qualifying examination that must be taken within 24 months from the date of enrollment in the program and is based on the four-course core (Stat 257, 258, 263, 264) and (b) an examination to determine the student's readiness to carry out the proposed dissertation research; and (4) a dissertation demonstrating the candidate's ability to do original research in one of the following fields: Bayesian inference, biostatistics, design of experiments, multivariate analysis, nonparametric statistics, probability (theoretical or applied), reliability theory, robust methods, sampling, statistical inference, stochastic processes, and time series.

**Departmental prerequisite:** One entrance unit in algebra is prerequisite to all first-group courses in statistics. Stat 131 is prerequisite to computer and information systems courses that follow it (i.e., Stat 133 to 150).

**First Group**

*51 **Introduction to Business and Economic Statistics** (3)
Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, probability distributions, sampling, estimation, tests of hypotheses, regression and correlation, index numbers. (Fall and spring)

*53 **Introduction to Statistics in Social Science** (3)
Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation. (Fall and spring)

*91 **Principles of Statistical Methods** (3)
Probability, frequency distributions and their characteristics, descriptive measures, estimation, tests of hypotheses, regression and correlation. Primarily for students in the natural sciences. (Fall)

**Second Group**

103 **Sampling in Accounting** (3)
Special emphasis on applications of sampling techniques and design to accounting problems. Prerequisite: Stat 51, 53, 91, or equivalent. (Fall and spring)

*104 **Statistics in Management, Administration, and Policy Studies** (3)
Lecture (3 hours), laboratory (1 hour). Introductory study of statistical techniques for research problems. For graduate students in fields other than statistics who have no previous statistics training.

* Stat 51, 53, 91, 104, 111, and 127 are related in their subject matter, and credit for only one of the six may be applied toward a degree.

105 **Statistics in the Behavioral Sciences** (3) Kirsch
Lecture (3 hours), laboratory (1 hour). Advanced study of statistical techniques for research problems. Analysis of variance, correlation techniques, nonparametric techniques, sampling theory. Prerequisite: Stat 53, 104, or equivalent, and satisfactory performance on a placement examination. (Fall and spring)

*111 **Business and Economic Statistics I** (3) Staff
Descriptive statistics, graphical methods, probability, special distributions, random variables, sampling, correlation, estimation and confidence intervals, hypothesis testing. (Fall)

112 **Business and Economics Statistics II** (3) Staff
Continuation of Stat 111, with emphasis on techniques of regression, chi-square, sampling designs, index numbers, and other topics used in economics and business. Prerequisite: Stat 111 or equivalent. (Spring)

118 **Regression Analysis** (3) Thall
Lecture (3 hours), laboratory (1 hour). Simple and multiple linear regression, partial correlation, residual analysis, stepwise model building, multicollinearity and diagnostic methods, indicator variables. Prerequisite: 3 semester hours selected from Stat 51, 53, 91, 104, 127. (Fall and spring)

119 **Analysis of Variance** (3) Staff
Lecture (3 hours), laboratory (1 hour). Introduction to the design of experiments and analysis of variance: randomized block, factorial, Latin square designs, and analysis of covariance. Prerequisite: Stat 118. (Spring)

121 **Contingency Table Techniques** (3) Staff
Analysis of multidimensional contingency tables, including estimation, tests of hypotheses, and log-linear regression. Prerequisite: Stat 118 or permission of instructor. (Spring)

123 **Introduction to Econometrics** (3) Staff
Same as Econ 123.

*127 **Statistics for the Biological Sciences** (3) Staff
Introduction to statistical techniques and reasoning applicable to the biomedical and related sciences. Properties of basic probability functions: binomial, Poisson, and normal. Data analysis, inference, and experimental design. (Fall and spring)

†129 **Introduction to Computing** (3) Staff
Computer and programming concepts: algorithm development. High-level language programs written by students will be run on the University computer. (Fall and spring)

130 **Computer Programming** (3) Thomas and Staff
Development of advanced computing ideas using a high-level language. Emphasis on careful design and implementation of programs using structured programming. Prerequisite: Math 31 or concurrent registration or permission of instructor and Stat 129 or equivalent. Laboratory fee, $25. (Fall and spring)

131 **Data Structures** (3) Thomas
Files and file systems. Linked lists and trees. Basic structure of processing operations: creating, updating, sorting, merging, searching, linking, hashing. Introduction to data processing, storage, and retrieval. This course is prerequisite to the following courses in computer and information systems (i.e., Stat 133 to 150). Prerequisite: Stat 130 or equivalent. Laboratory fee, $25. (Fall and spring)

132 **Introduction to Discrete Structures** (3) Mahmoud
Joint offering of the Statistics and Mathematics Departments. Discrete structures and associated mathematical tools. Topics include sets, functions,

* Stat 51, 53, 91, 104, 111, and 127 are related to their subject matter, and credit for only one of the six may be applied toward a degree.
† Credit will not be given for both Stat 129 and 197.

relations, directed and undirected graphs, propositional calculus, Boolean algebras, with applications to computer science. Prerequisite: Stat 130 and Math 31. Laboratory fee, $25. (Fall)

133 **Computer Organization and Assembly Language** (3) Jacob
Data representation and arithmetic; computer structure and machine language; computer architecture. Assembly language; addressing techniques; file input and output. Study of an actual small computer. Prerequisite: Stat 131. Laboratory fee, $25. (Fall)

134 **Operating Systems** (3) Jacob
Techniques for handling simultaneous processes; dynamic procedure activation; synchronization and mutual exclusion; semaphores. Operating system design methodologies; abstract data types; monitors; kernels. Memory management; memory hierarchy; paging. Recovery procedures. Prerequisite: Stat 133. (Spring)

135 **Survey of Programming Languages** (3) Grier
Structured and nonstructured languages; list-structured languages; pattern matching and symbol manipulation languages; interpretive and interactive languages; variable binding. Prerequisite: Stat 131. (Spring)

142 **Introduction to Automata Theory** (3) Mahmoud
Finite state automata. Turing machines and computability; universal Turing machine; computable and noncomputable functions; halting problem; computational complexity. Formal grammars and their relationship to automata. Prerequisite: Stat 131 and a course in propositional calculus.

145 **Compiler Design** (3) Bunker
Grammars, languages, syntax, and semantics. Lexical analysis; symbol tables; context-free language parsing techniques; code generation. Prerequisite: Stat 142.

146 **Design and Development of Software** (3) Bunker
Design techniques; structured programming; code reading; stepwise refinement; top–down design; information hiding; coupling and cohesion. Development of a multicomponent software project by students. Prerequisite: Stat 131. Laboratory fee, $25. (Fall)

147 **Artificial Intelligence** (3) Staff
Representation of knowledge; notational systems such as logics, programming languages, trees, and networks; LISP. Search strategies; heuristics. production rule systems. Algorithms used in AI; natural language processing, vision, manipulator operation, theorem proving, problem solving. Prerequisite: Stat 131. Laboratory fee, $25.

148 **Database Systems** (3) Bunker
Sequential file processing; random access storage. Hierarchical, network, and relational data models. Data normalization; data description languages; query facilities. File and index organization; inverted files. Data integrity and reliability; computer security. Prerequisite: Stat 131.

149 **Simulation and Modeling** (3) Grier
Discrete simulation of real-world systems. Simulation techniques and languages; queues; event-driven simulation systems. Analysis of algorithms, predicting system performance; queuing theory. Prerequisite: Stat 131; some statistics.

150 **Current Topics** (3) Staff
Concepts of programming, programming languages, operating systems, nonnumeric programming compiler techniques. Prerequisite: Stat 131 or permission of instructor. May be repeated for credit. (Spring)

153–54 **Mathematical Models in Population Genetics** (3–3) Staff
Basic elements of genetics and cell reproduction, deterministic models of gene frequency; and Hardy-Weinberg law; effects of mutation, migration, and selection on gene frequency; multiple loci and multiple allele models; inbreeding; Fisher's fundamental theorem of natural selection, stochastic models of changes in gene frequency, including methods of direct product branching processes and diffusion equation methods.

157–58 **Introduction to Mathematical Statistics** (3–3) Staff
Distribution theory, sampling theory, estimation, hypothesis testing, regression analysis, experimental design. Prerequisite: Math 31 and 32 or equivalent. (Academic year)

160 **Mathematical Statistics for Economics Students** (3) Staff
Preparation for Stat 275. Prerequisite: Math 31 and 32 or equivalent. (Spring)

181 **Applied Time Series Analysis** (3) Kirkendall
Autoregressive integrated moving average (ARIMA) modeling and forecasting of univariate time series. Estimation of spectral density functions, white noise tests, and tests for periodicities. Theory and applications using SAS on the GWU computer. Prerequisite: Math 33, Stat 157–58 or 118.

183 **Intermediate Statistical Laboratory: Statistical Computing Packages** (3) Grier
Application of program packages (e.g., SAS, SPSS, Biomed) to the solution of multivariate statistical problems. Basic concepts in data file preparation/manipulation, analytical techniques, and interpretation of results. Prerequisite: an introductory statistics course.

187 **Introduction to Sampling** (3) Staff
Problems of sampling and sample design. Prerequisite: Stat 91 or equivalent. (Fall)

188 **Nonparametric Statistical Inference** (3) Staff
Statistical inference when the form of the underlying distribution is not fully specified. Nonparametric procedures for estimation and testing hypotheses. An introduction to robust procedures. Prerequisite: Stat 91 or equivalent. (Spring)

189–90 **Mathematical Probability and Applications** (3–3) Staff
Combinatorial analysis, conditional probability, stochastic independence, probability distributions, random variables, laws of large numbers. Prerequisite: differential and integral calculus. (Academic year)

193 **Questionnaire Design** (3) Staff
Principles and procedures for developing effective questionnaires for mail, telephone, and personal interview surveys. Prerequisite: Stat 187 or equivalent, or permission of instructor.

195 **Reading and Research in Statistics** (arr.) Staff
May be repeated once for credit. (Fall and spring)

196 **Seminar: Major Governmental Surveys** (3) Staff
Analysis of problems in conducting and using governmental surveys. Topics include sample design, question wording, field collection procedures, and basic tabulations. Surveys covered include the 1980 census, the Consumer Price Index series, and a representative survey in the areas of education and health.

*197 **Data Analysis Tools and the Personal Computer** (3) Thomas
Study of support tools for data analysis and research. Topics in statistics, mathematics, computer programming, graphics, word processing, editing, text formatting, spread sheets, and data base. An individual project related to current research or work environment is required of each student. All work is done on a personal computer. This course satisfies the computer tool requirement. Prerequisite: Stat 118; or Math 32; or permission of instructor. Laboratory fee, $25. (Fall and spring)

198 **Special Topics** (3) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the content differs.

**Third Group**

201–2 **Mathematical Statistics** (3–3) Lilliefors
Distribution theory, sampling theory, estimation, sufficient statistics, hypoth-

* Credit will not be given for both Stat 129 and 197.

esis testing, analysis of variance, multivariate normal distribution. Prerequisite: Math 33 and 124. (Academic year)

203 **Fundamental Algorithms and Their Analysis** (3) Mahmoud
Basic tools for the study of algorithms, including asymptotic analysis and recurrence relations. Graphs and their representation in a computer. Some NP-complete graph problems. Open to qualified seniors. Prerequisite: Math 124; Math 113 or Stat 198; Stat 131. Laboratory fee, $25. (Spring)

204 **Expert Systems** (3) Staff
Advanced study of machine intelligence, with special emphasis on expert systems. Topics include advanced systems for problem solving and automated reasoning, reasoning with uncertainty, search control, learning and learning machines. Theory and applications. Prerequisite: Stat 147. (Spring)

206 **Multivariate Methods in the Behavioral Sciences** (3) Kirsch
Application of multivariate analysis to data of the social sciences. Techniques covered include factor analysis, cluster analysis, discriminant analysis, and other topics. Prerequisite: Stat 105 or 118, and prior permission of the instructor. Not open to graduate students in statistics.

207 **Methods of Statistical Computing I** (3) Lilliefors
Error analysis, computational aspects of linear models, sweep operator, random number generation, simulation, resampling. Optimization, numerical integration (Gaussian quadrature, Simpson's rule); E–M algorithm. Prerequisite: Stat 118, 129, 201–2; Math 124.

208 **Methods of Statistical Computing II** (3) Grier
Generalized curve fitting, splines, spline smoothers; numerical linear algebra, including matrix decomposition and eigenvalue problems; optimization techniques, including maximum likelihood estimation; graphics for data display, including projections, convex hulls, point clouds, hidden line removal.

210 **Data Analysis** (3) Lachin
A study of statistical methods for data analysis, using computerized statistical procedures. Multiple regression and the general linear model, discrimination and classification, the analysis of contingency tables, and nonparametric methods. Prerequisite: Stat 118 and either Stat 183 or 197 or demonstrated proficiency in computer programming. (Spring)

215–16 **Applied Multivariate Analysis** (3–3) Rauberta-
Application of multivariate statistical techniques to multidimensional research data from the behavioral, social, biological, medical, and physical sciences. Prerequisite: Stat 119, 157–58, and Math 124. (Academic year)

217–18 **Advanced ANOVA and Experimental Design** (3-3) Thall
Advanced theory and application of general linear parametric model to experimental designs, estimation, and hypothesis testing. Prerequisite: Stat 157–58 or 201–2; Math 124. (Academic year)

221 **Design of Experiments for Behavioral Sciences** (3) Kirsch
Applications of advanced experimental design to research problems in behavioral sciences and education. Prerequisite: Stat 105 or 118 or equivalent and permission of instructor. Not open to graduate students in mathematical statistics. (Spring)

223 **Bayesian Inference** (3) Singpurwalla
Systematic development of Bayesian viewpoint, with applications to the classical problems of statistics. Prerequisite: Stat 201–2.

225–26 **Biostatistics** (3–3) Greenhouse
Probability models, inference, and study design as applied to biomedical investigations. Prerequisite: Stat 201–2. (Alternate academic years)

227 **Statistical Methods for Biomedical Research** (3) Lach-
Statistical methods for the design and analysis of biomedical research studies, including the randomized clinical trial and other observational and epidemiologic studies. Evaluation of power and sample size, randomization,

analysis of binary data, survival analysis, and regression. Prerequisite: Stat 105 or 118 or permission of instructor. (Fall)

231 **Contingency Table Analysis** (3) Staff
A study of the theoretical bases underlying the analysis of categorial data. Prerequisite: Stat 201–2 or 257–58.

242 **Advanced Statistical Problems in Economic Analysis** (3) Gastwirth
Applications of advanced theory to economic data.

257 **Probability** (3) Smythe
Probabilistic foundations of statistics, probability distributions, random variables, moments, characteristic functions, modes of convergence, limit theorems, probability bounds. Prerequisite: Stat 201–2, knowledge of calculus through functions of several variables and series. (Fall)

258 **Distribution Theory** (3) Gastwirth
Special distributions of statistics, small and large sample theory, order statistics, and spacings. Prerequisite: Stat 257. (Spring)

259–60 **Advanced Mathematical Probability** (3–3) Staff
Measure theory, probability spaces, random variables, probability distributions, sequences and sums of random variables, conditioning, limit theorems, martingales. Prerequisite: advanced calculus and permission of instructor. (Alternate academic years)

261 **Sequential Design and Analysis** (3) Staff
Wald's theory of sequential designs, optional stopping, choice of sequential experiments. Prerequisite: Stat 201–2.

262 **Nonparametric Inference** (3) Staff
Inference when the form of the underlying distribution is unspecified. Prerequisite: Stat 201–2.

263 **Advanced Statistical Theory I** (3) Nayak
Linear models, decision theoretic estimation, classical point estimation. Prerequisite: Stat 201–2. (Fall)

264 **Advanced Statistical Theory II** (3) Nayak
Asymptotic theory, hypothesis testing, confidence regions. Prerequisite: Stat 201–2, 257. (Spring)

265 **Multivariate Analysis** (3) Staff
Multivariate normal distribution. Hotelling's $T^2$ and generalized $T_0^2$, Wishart distribution, discrimination and classification. Prerequisite: Stat 201–2 and Math 124.

266 **Topics in Multivariate Analysis** (3) Staff
Multivariate analysis of variance, principal components, canonical correlation, factor analysis. Prerequisite: Stat 265.

273–74 **Stochastic Processes** (3–3) Smythe
Fundamental notions of Markov chains and processes, generating functions, recurrence, limit theorems, random walks, Poisson processes, birth and death processes, applications. Prerequisite: Stat 189–90, and 201–2 or 257–58. (Alternate academic years)

275 **Econometrics I: Introduction** (3) Staff
Joint offering of the Departments of Statistics and Economics. Single-equation models of economic behavior. Statistical methods for testing economic hypotheses and estimating parameters. Introduction to simultaneous equation problems. Prerequisite: Econ 123 or permission of instructor. Recommended: a course in matrix theory. (Fall)

276 **Econometrics II: Simultaneous Equations Models** (3) Staff
Joint offering of the Departments of Statistics and Economics. Economic models and simultaneous equations systems. Prerequisite: Stat 275. (Spring)

279 **Methods in Economic Statistics** (3) Gastwirth
Joint offering of the Economics and Statistics Departments. Application of statistical methods to economic data. Univariate and multiple regression and nonparametric techniques are used to analyze economic data. Measures of inequality, economic concentration, and forecast accuracy are discussed. Prerequisite a one-year course in statistics. (Fall)

281 **Advanced Time Series Analysis** (3) Kirkendall
Autoregressive integrated moving average (ARIMA) modeling and forecasting of univariate and multivariate time series. Statespace or Kalman filter models, spectral analysis of multiple time series. Theory and applications using the University computer. Prerequisite: Math 33, Stat 201–2 or equivalent. (Spring)

282 **Time Series Analysis II: Statistical Inference** (3) Staff
Multivariate normal processes, spectral estimation, tests of hypotheses, regression, discrimination filtering, spectral analysis of variance. Prerequisite: Stat 261.

283 **Advanced Statistical Computer Concepts** (3) Staff
Use of high-level statistical computer programs (such as LISREL, CLUSTAN, KYST, INDSCAL, AID, CHAID) and statistical computer packages for advanced data analysis. Extension of concepts introduced in Stat 183 to complex file structures (such as hierarchical files) and advanced designs such as multiwave panel designs and multiple cross-sectional surveys. Advanced file manipulation techniques, job control language, and archiving of large data files. Prerequisite: Stat 183 and either Stat 105 or 118.

285–86 **Seminar: Special Topics in Sample Survey** (3–3) Staff
Admission by permission of instructor.

287–88 **Modern Theory of Sample Surveys** (3–3) Staff
Application of statistical theory to the sampling of finite populations. Simple, stratified, cluster, double and subsampling. Special topics, including superpopulations and randomized response. Prerequisite: Stat 91 and Math 33 or equivalent. (Academic year)

289 **Seminar** (3) Staff
Admission by permission of instructor. (Fall and spring)

290 **Principles of Demography** (3) Staff
Same as Econ 290.

291 **Methods of Demographic Analysis** (3) Staff
Same as Econ 291.

295 **Reading and Research** (3) Staff
May be repeated once for credit. (Fall or spring)

297 **Problems in Mathematical Statistics** (3) Staff

298 **Seminar: Special Topics** (3) Staff

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

**Fourth Group**

378 **Seminar: Topics in Econometrics** (3) Staff
Same as Econ 378.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

## TEACHER PREPARATION AND SPECIAL EDUCATION

*Professors* R.S. Cottrell, Jr., R.K. Ives, J.R. Shotel, M.S. Castleberry, R.N. Ianacone (Cha... G.L. Horrworth, C.D. Holden
*Associate Professors* N.J. Sobel, A.J. Mazur, M.B. Freund, T.J. Rosegrant
*Assistant Professors* J.M. Taymans, L.H. Cuenin, L.R. Putnam, S.S. Beck (*Visiting*), V.M. Camerlengo (*Visiting*)

See the School of Education and Human Development for programs of study leading to the degrees of Bachelor of Arts in Education and Human Development, Master of Arts in Education and Human Development, Master of Education, and Doctor of Educatio...

## TEACHER EDUCATION

**First Group**

9 **Techniques for Acquiring Meaning from College Texts** (0)
The course is divided into three modules, which may be taken in sequence or individually. Each module addresses the acquisition, retention, and utilization of meaning as presented in college text materials. Analysis and synthesis of information into verbal and written discourse are emphasized. Each student receives an evaluation of his or her college-level reading ability. Placement testing is required, for which a $10 fee is charged. Tuition is charged at the rate of 1 credit hour for each module.

50 **Introduction to Education and Human Services** (3) Staff
The scope of education and human services is defined from historical, philosophical, and cross-cultural perspectives. Field trips and group field experience. (Fall and spring)

**Second Group**

TrEd 136, 137, 138, 139, 140, 142, 144, and 146 are special methods courses that are to be elected in the senior year by students in the Secondary Field of Study in secondary education after substantial preparation in the teaching fields concerned. Course requirements and hours of credit vary with license requirements. Prerequisite to all special methods courses: Educ 104 and TrEd 105 for elementary majors; TrEd 131 for those in the Secondary Field of Study in secondary education.

105 **Social Issues in Education and Human Services** (3) Staff
Historical and social development of education and human services, contemporary issues, interrelationship of educational and human service institutions, policy considerations, and future issues. Fieldwork is required. Prerequisite: TrEd 50 or permission of instructor. (Fall and spring)

110 **Elementary School Teaching of Reading** (3) Horrworth
Introduction to methods, techniques, materials, and activities essential to a good elementary school reading program. Prerequisite: Educ 104 and TrEd 105 or teaching experience.

111 **Elementary School Curriculum and Methods** (3 to 15) Beck, Mazur
A comprehensive block course that includes 3 credits each in diagnostic reading, mathematics, science, language arts, and social studies; 1 credit each in music, art, and physical education. Pre-student teaching three days a week. Prerequisite: Educ 71, 72, 104; TrEd 105; and senior standing. (Fall)

118 **Elementary Reading: Classroom Diagnosis and Instruction** (3) Horrworth
Emphasis on diagnostic procedures aimed at individualizing and improving classroom instruction. Prerequisite: TrEd 110 or equivalent. (Fall)

128 **Children's Literature** (3) Putnam
Landmark works in the various genres of children's literature; strategies for integrating literature into the school curriculum. (Spring)

131 **Secondary School Principles and Methods** (3) Staff
For seniors. Classroom management and teaching techniques for initiating, guiding, and evaluating learning activities. Group work to be arranged. Prerequisite: Educ 104 and TrEd 105. (Fall)

132 **Student Teaching in Early Childhood Schools** (3 or 6) Staff
For seniors. Supervised teaching in selected prekindergarten or kindergarten class in accredited school; seminar. Admission by permission of instructor. Prerequisite: TrEd 111 or equivalent; TrEd 150, 152, 153, 154. (Fall and spring)

134 **Student Teaching in Secondary Schools** (6 to 9) Camerlengo
For seniors. Admission by permission of instructor. Prerequisite: TrEd 131. (Fall and spring)

135 **Student Teaching in Elementary Schools** (6 or 12) Moore and Staff
Supervised teaching in an elementary school. Required seminar. Admission by permission of instructor. Prerequisite: TrEd 111 or equivalent. (Spring)

136 **Teaching English in Secondary Schools** (3) Staff
Lecture (2 hours), fieldwork (2 hours). Prerequisite: 18 semester hours in English. (Spring)

138 **Teaching Social Studies in Secondary Schools** (3) Staff
Lecture (2 hours), fieldwork (2 hours). Prerequisite: 24 semester hours of social studies. (Spring)

139 **Teaching Art in Secondary Schools** (3) Staff
Lecture (2 hours), laboratory (2 hours). Prerequisite: 24 semester hours of art. Material fee, $5. (Spring)

140 **Teaching Mathematics in Secondary Schools** (3) Camerlengo
Lecture (2 hours), fieldwork (2 hours). Prerequisite: mathematics through calculus. (Spring)

142 **Teaching Music in Secondary Schools** (3) Staff
Prerequisite: 24 semester hours of music courses.

144 **Teaching Science in Secondary Schools** (3) Staff
Lecture (2 hours), fieldwork (2 hours). Prerequisite: 24 semester hours of science. (Spring)

146 **Teaching Foreign Languages** (3) Staff
Lecture (2 hours), fieldwork (2 hours). Prerequisite: 18 semester hours of one foreign language. (Spring)

150 **Foundations of Early Childhood Education** (3) Staff
Historical development, philosophy, and objectives of nursery schools, kindergartens, and day care; exploration of contemporary programs and models with curriculum implications for schools in the United States and abroad. Admission by permission of instructor. (Fall)

152 **Early Childhood Curriculum** (3) Staff
Rationale, development, content approaches, programs, and materials in language arts, mathematics, science, health, social studies, and aesthetic education. Admission by permission of instructor. (Fall)

153 **Role of the Professional in Early Childhood Education** (3) Staff
Planning, reporting, records, teacher–child and teacher–family interaction, diagnosis and evaluation, working with paraprofessionals and parents. Emphasis on total classroom ecology. Admission by permission of instructor. (Spring)

154 **Community Resources and Materials for the Young Child** (3) Staff
Interaction with community agencies and resources for services; equipment; play activities, curriculum materials, and methods for teaching the infant and young child. Admission by permission of instructor. (Spring)

197–98 **Research and Independent Study** (3–3) Staff
Individual or group study or research under the guidance of staff members. Program and conferences arranged with advisor. Admission by permission of advisor. (Academic year)

**Third Group**

Department prerequisites: A degree from an accredited institution and adequate professional preparation are prerequisite to all third-group courses in education. Undergraduate students in their senior year may enroll in third-group courses with permission of the instructor.

205 **Foundations of Curriculum Development** (3) Staff
For experienced teachers. Curriculum research and design, issues and trends, comparison of curriculum patterns, curriculum development in subject areas, and consideration of current field-related problems. (Fall)

216 **Recent Developments in Teaching Social Studies** (3) Staff
*(Formerly Educ 316)*
For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective teaching of social studies. Admission by permission of instructor.

217 **Recent Developments in Teaching Science** (3) Staff
*(Formerly Educ 317)*
For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective teaching of science. Admission by permission of instructor.

218 **Recent Developments in Teaching Mathematics** (3) Staff
*(Formerly Educ 320)*
For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective teaching of mathematics. Admission by permission of instructor. (Spring)

220 **Selected Topics in Teacher Education** (arr.) Staff
Topics announced in the *Schedule of Classes*.

222 **Foundations of Reading Development: K–Adult** (3) Horrworth
Basic theories and processes of reading acquisition and development; linguistic, cognitive, developmental, social, and affective bases of reading; varieties and influences of media and instructional strategies.

223 **Reading Instruction in Content Areas: Elementary, Intermediate, and Secondary Schools** (3) Horrworth
Emphasis on basic group instructional methods and media; teaching demonstrations of basic reading and study skills in content subjects; study of readability of content materials; research and application of formulas. (Fall)

224 **Diagnostic Teaching of Reading: K–6** (3) Horrworth
Classroom teaching and testing techniques for elementary teachers; construction of informal tests; administration, scoring, and interpretation of informal tests and other measures of evaluation; selecting and planning activities suitable for correction of specific problems. Prerequisite: at least one previous course in reading. (Spring)

225 **Measuring Mental Functions** (3) Johnson
Administrating, scoring, interpreting, and reporting the Wechsler Intelligence Scale for Children–Revised (WISC–R) and the Wechsler Intelligence Scale for Adults–Revised (WAIS–R). (Fall and spring)

226 **Diagnostic Teaching of Reading in Secondary School** (3) Horrworth
Application of instructional strategies and techniques presented in Educ 223 and 224. Construction of informal tests; administering, scoring, and interpreting informal and standardized tests; study and evaluation of materials; teaching strategies for on-grade students and for those with reading problems. Admission by permission of instructor. (Spring)

227 **Current Issues in Elementary Education** (3) Staff
Identification, definition, and analysis of some of the most important problems facing the contemporary American elementary school. (Fall)

228 **Instructional Areas in Elementary Education** (3) Staff
Current trends and research in reading, language arts, social studies, mathematics, science, music, art, and physical education. (Spring)

230 **Foundations of Early Childhood Education** (3) Staff
*(Formerly Educ 330)*
Historical developments; philosophy and objectives of nursery schools, kindergartens, and day care centers; exploration of contemporary programs and models, with curriculum implications for schools in the United States and abroad. (Fall)

231 **Community Resources and Materials for the Young Child** (3) Staff
*(Formerly Educ 334)*
Interaction with community agencies for service, resources, and equipment; physical facilities, play activities, curriculum materials, and methods for teaching the infant and young child. (Spring)

232 **Early Childhood Curriculum** (3) Staff
*(Formerly Educ 342)*
Rationale, development, content, approaches, programs, and materials in

language arts, mathematics, science, health, social studies, and aesthetic education. (Fall)

233 **Role of the Professional in Early Childhood Education** (3) Staff
*(Formerly Educ 333)*
Planning, reporting, maintaining records, teacher–child and teacher–family interaction, diagnosis and evaluations, working with paraprofessionals and parents. Emphasis on total classroom environment. (Spring)

234 **Professional Internship in Secondary Education** (6) Staff

235 **Professional Internship in Elementary Education** (9) Staff

236 **Analysis of Teaching** (3) Staff
Teaching viewed as a system; component aspects are examined with a view toward developing a critical method of analysis. (Fall)

237 **Practicum in Early Childhood Education** (3 to 6)
*(Formerly Educ 335)*
Supervised professional activity in selected early childhood programs; seminar. Prerequisite: 12 semester hours in early childhood education and permission of instructor. (Fall and spring)

238 **Clinical Practicum in Reading** (3 to 6) Horrworth
*(Formerly Educ 336)*
Supervised clinical experience in testing, tutoring, and teaching. Approximately 120 clinic hours required. Admission by permission of instructor

241 **Education of the Gifted and Talented** (3) Rashid
Nature and discovery of giftedness, provision for the gifted in educational settings. Research findings and issues. (Summer)

254 **The Middle School** (3) Staff
Development, organization, and practices; emphasis on the learner, the teacher, the administrator, the curriculum, and the setting of the school for the preadolescent. (Fall)

287–88 **Clinical Study of Reading Problems** (3–3) Putnam
Testing and tutoring children and adults with reading problems. A case study approach is emphasized; participants are trained to administer a diagnostic battery of tests, evaluate results, and plan and implement tutoring strategies. Prerequisite: TrEd 222 and 224. (Academic year)

289 **Organization and Administration of Reading Programs** (3) Horrworth
For school administrators and reading teachers. Problems in planning, reorganizing, and improving the total reading program. (Fall)

290 **Severe Learning Disabilities in Reading** (3) Putnam
For experienced teachers. Case studies of children and/or adults with severe reading problems; planning and implementing instructional programs. Admission by permission of instructor. (Spring)

291 **Reading and Writing Across the Curriculum** (3) Putnam
*(Formerly Educ 289)*
A whole-language approach to structuring classroom curriculum; strategies for developing students' reading and writing skills while studying literature, social studies, and science. (Fall)

292 **Internship: Reading** (3 to 6) Horrworth
*(Formerly Educ 322)*
Limited to graduate students in reading education. Experience in a selected area of teaching or supervisory service in reading education programs. Prerequisite: permission of instructor. (Fall and spring)

297–98 **Research and Independent Study** (3–3) Staff
Individual research under the guidance of a staff member; program and conferences arranged with an instructor. (Academic year)

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**Fourth Group**

308 **Instructional Processes in Teacher Preparation and Special Education** (3)
Review of instructional processes as they affect education and spec...

education, including university and staff development perspectives; opportunities for practice in needs assessment, program design, and instruction. Admission by permission of instructor. (Fall)

321 **Practicum in Curriculum and Instruction** (3 to 6) Staff
Supervised field experience in curriculum. Admission by permission of instructor. Prerequisite: TrEd 205. (Fall and spring)

324 **Teaching Reading and Study Skills at the College Level** (3) Staff
Evaluation of reading skills at the college level. Development of college reading programs, including diagnostic and teaching techniques, program planning and implementation. Prerequisite: TrEd 226 or equivalent, and permission of instructor. (Spring)

325 **Curriculum Theory** (3) Staff
Examination of reviews and research studies on curriculum theory. Focus on trends, values, interpretations, fads, design systems, and evaluation. Prerequisite: TrEd 205. (Spring)

345 **Consultation Skills in Teacher Preparation and Special Education** (3) Ives, Shotel
Consultation models from organizational development, organizational psychology, and mental health applied to in-service training for educational personnel and programs for the special child in the public schools. Material fee, $25. (Spring)

373 **Pre-Service Teacher Education** (3) Staff
*(Formerly Educ 273)*
Program development, governance, issues, trends. (Fall, alternate years)

374 **In-Service Planning and Programming** (3) Staff
*(Formerly Educ 274)*
Continuing professional development of educators, costs and benefits to society, programs and practices, current issues. (Spring, alternate years)

378 **Post-Master's Internship in Curriculum and Instruction** (3 to 6) Staff
Supervised fieldwork for selected experienced teachers. (Fall and spring)

390 **Seminar: Curriculum and Instruction** (arr.) Staff
*(Formerly Educ 425)*

391 **Dissertation Research** (arr.) Staff
*(Formerly Educ 491)*
Preparation of a research outline; research and writing of an approved doctoral dissertation under the direction of major advisor and dissertation committee. Prerequisite: TrEd 390.

## SPECIAL EDUCATION

### First Group

57 **Curriculum Development for the Special-Needs Child** (3) Staff
An overview of theory and scope of pre-academic and academic curriculum development as it relates to the special child (Fall)

58 **Curriculum Adaptation for the Special-Needs Child** (3) Staff
Lectures, demonstrations, and experiences designed to develop the student's ability to adapt curriculum and style of presentation to meet the needs of the special child. Prerequisite: SpEd 57. (Spring)

### Second Group

101 **Design and Implementation of the Special Education Classroom** (3) Mazur
Instructional experiences designed to refine the insights and competencies essential for successful teaching in the special education classroom. (Fall)

102 **Practicum in Teaching the Child With Special Needs: Methods and Materials** (3 or 6) Mazur
Laboratory course taught in an elementary public school. Students observe and participate in a demonstration seminar conducted by the instructor. Must

be taken concurrently with SpEd 189. Material fee, $50. (Fall)

103 **Practicum: Teaching the Child With Special Needs: Creative Programming** (3 or 6) Mazur
Continuation of SpEd 102. Concentration on the total programming of the child with special needs. Must be taken concurrently with SpEd 190. Material fee, $50. (Spring)

160 **Academic and Psychosocial Assessment of the Elementary-School-Aged Exceptional Child** (3) Mazur
An investigation of the assessment process: theory and scope of psychoeducational assessment, informal and formal assessment, clinical experience in informal assessment, application of diagnostic findings to instructional recommendations. Material fee, $25.

168 **Overview of Handicapping Conditions: Etiology and Symptomatology** (3) Staff
Causes and symptoms of most prevalent handicapping conditions in children who can be mainstreamed.

170 **Dynamics of Human Relations: Theory and Practice** (3) Mazur
Discussion of psychosocial theory as it relates to successful interaction with children. (Fall)

189 **Preprofessional Internship: Program Adaptation for the Special-Needs Child in the Regular Classroom** (3) Mazur
Supervised internship in school setting. Emphasis on intensive study of children with special needs. Must be taken concurrently with SpEd 102. (Fall)

190 **Educational Intervention for the Special-Needs Child: Methods and Materials** (3) Staff
Observation and participation in various special education settings. Emphasis on exposure to and familiarity with goals and programs of various special education models. Must be taken concurrently with 103. (Spring)

197–98 **Research and Independent Study** (3–3) Staff
Individual or group study or research under the guidance of staff members. Program and conferences arranged with advisor. Admission by permission of advisor. (Academic year)

199 **Practicum in Special Education** (6 to 12) Mazur
Supervised teaching internship in a school-based intervention program. Student teaching with children identified as needing special education services. A minimum of 240 clock hours required. Admission by permission of the instructor. (Fall)

**Third Group** Staff

201 **Overview of Special Education** (3)
*(Formerly SpEd 150)*
Survey course to acquaint prospective teachers with special education and to help them become aware of the various educational modifications necessary to accommodate children with special needs in a school program. (Fall) Staff

220 **Selected Topics in Special Education** (arr.) Freund
Courses on topics relevant to special educators offered to selected groups.

221 **Accessing Community Systems for the Special-Needs Individual** (3) Inacone
Overview of access and service delivery for the special-needs individual and his or her family. The relationship of public policy to service delivery is considered. Material fee, $25. (Spring and summer)

222 **Legislative Issues and Concerns in Supportive Training, Transition, and Education Programs** (3)
Issues relating to interpreting and monitoring compliance of legislation designed to address more adequately the needs of the disabled. Emphasis on practical strategies in response to the mandates of federal legislation. Material fee, $25. (Fall)

229 **Interpretation and Application of Academic and Vocational Assessment Information** (3) Ianacone
Specific strategies and techniques to synthesize, analyze, and interpret assessment information appropriate to secondary-level special education programming. Observation and recording procedures, vocational profiling, report development, and postevaluation conference. Material fee, $20.

230 **Vocational Assessment of Individuals Who Are Handicapped** (3) Ianacone
Investigation of the vocational assessment process, including formal and informal systems to determine vocational interests, aptitudes, and employability skills. Material fee, $25. (Spring)

231 **Transitional Special Education Programming** (3) Taymans
Selected techniques and processes used in programming for the needs of handicapped individuals. Emphasis on the development of skills related to professional liaison and support roles in the design of instructional arrangements and cooperative training. Must be taken concurrently with SpEd 233. Material fee, $20.

232 **Dynamics of Career Intervention Techniques and Strategies for the Handicapped** (3) Cuenin
Specific intervention strategies and techniques focusing on career and vocational decision making for handicapped individuals. Emphasis on combining theoretical constructs with practical field experience. (Fall)

233 **Curriculum in Transitional Special Education** (3) Taymans
Theory and practice in planning, implementing, and evaluating curriculum for handicapped adolescents and adults. Emphasis on techniques for modifying curriculum and materials for individualized programming. Requires field-site curriculum implementation. Must be taken concurrently with SpEd 231.

234 **Seminar in Supportive Training, Transition, and Education Programs** (3) Staff
Focus on the design, implementation, and evaluation of in-service programming to effect change; analysis and development of related professional presentation and writing skills. Material fee, $20. (Spring or summer)

235 **Coordination of Job Placement Programs in Transitional Special Education** (3) Cuenin
Rationale, resources, and programming strategies for the development and coordination of successful job placement programs for individuals who are handicapped.

236 **Introduction to Transitional Services** (3) Staff
Introduction and overview of programs and services for secondary-level handicapped youth that focus on the transition from school to community, including employment, personal and social skill development, and community living. Focus on techniques, resources, and models for planning and implementing transitional special education at all levels of service delivery. Material fee, $25.

240 **Developmental Process of Parenting: Parenting Handicapped Individuals** (3) Freund and Staff
The developmental process of becoming a parent and ongoing parenting. Particular attention is paid to parenting individuals who are handicapped. Material fee, $20. (Fall)

242 **Neurodevelopmental Programming for Handicapped Infants and Toddlers** (3 or 6) Staff
Provides students with a theoretical background and practical experience to translate the neurodevelopmental model into techniques for developing and implementing educational programs for handicapped infants and toddlers. Prerequisite: SpEd 268 or permission of instructor. Material fee, $30. (Spring and summer)

243 **Assessment of the Special-Needs Infant** (3) Freund
Exploration of a variety of assessment strategies for high-risk and handicapped infants; current practices and selected instruments. (Fall)

250 **Specialized Techniques and Materials: Transitional Special Education** (3) Cuenin
Specialized instructional techniques and resources in secondary, postsecondary, business, and community programming for individuals who are handicapped. Emphasis on collaborative planning and programming.

253 **Special Education in Corrections: State of the Art** (3) Staff
An introduction to the delivery of special education services within the juvenile justice and corrections systems. Presentations by theorists and practicing professionals.

254 **Special Education in Corrections: Field Experiences** (3) Staff
Site visits to local, state, and federal juvenile correction facilities and advocacy organizations, coordinated by a series of seminars tying theory to practice. Emphasis on program structure, goals, and general service delivery for handicapped individuals in correctional education. Material fee, $20.

255 **Interdisciplinary Case Management Approach to Assessment for Special Populations** (3) Staff
Examination of programmatic implications of integrative academic, vocational, and psychological evaluation for special-needs populations. Emphasis on integration and interpretation of data as a basis for short- and long-term service planning through an interdisciplinary case management structure. Material fee, $25.

256 **Curriculum-Based Methods for Individuals Who Are Handicapped** (3) Staff
Curriculum design, implementation, and modification for individuals in special education settings; emphasis on the methodology needed to develop individualized programming. Material fee, $25. (Fall)

260 **Developmental Assessment in Special Education** (3) Staff
Development of assessment skills with academic diagnostic instruments. Study of validity, reliability, nonbiased testing, aptitude, and achievement. Material fee, $25. (Fall)

261 **Practicum: Methods and Materials for Young Exceptional Children** (3 or 6) Staff
Clinical practice in design and implementation of educational strategies and materials. Three dimensions: designing and developing teaching materials, classroom teaching, feedback and evaluation with professor. Taught at a demonstration site. Requires eight hours a week on site. (Fall) Castleberry

262 **Formal Assessment of Young Exceptional Children** (3) Staff
Weekly seminar designed to prepare early childhood special educators to translate formal assessment data into instructional programming. Requires fieldwork with children. Material fee, $25. (Fall)

263 **Development of the Infant with Special Needs** (3) Staff
The processes of normal infant development and interrelationships among areas of development, relationship of these processes to the growth and development of the at-risk child. Material fee, $25. (Fall and summer) Freund

264 **Educational Implications of Medical and Genetic Conditions of the Developmentally Delayed Child** (3)
Specialized programs, techniques, and methods for teaching developmentally delayed children, with emphasis on genetically linked handicapping conditions. Practitioner needs and programming concerns are stressed. Material fee, $25. (Spring) Ives, Freund

265 **Clinical Experience With Multiply Handicapped and Developmentally Disabled Young Children** (3)
Field experience designed for students with limited experience in early childhood special education. Three-week intensive involvement in an early childhood special education setting. (Summer)

266 **The Development of Language in Individuals Who Are Handicapped** (3) Rosegrant, Shotel
Introduction to the study of language acquisition and the development of language programs for the special-needs child. (Summer)

268 **Development of Young Exceptional Children: General Etiology of Handicapping Conditions** (3) Rosegrant
An in-depth examination of the development of young exceptional children and the specific nature of handicapping conditions. Lecture and field visits. Material fee, $25. (Fall)

269 **Etiology, Symptomatology, and Approaches to Intervention With Special-Needs Individuals** (3) Rosegrant
General principles of typical and atypical/development of special-needs individuals. Etiology and symptomatology of handicapping conditions. Extensive field observations. Material fee, $25. (Spring)

270 **Mainstreaming: Adapting Attitudes, Programs, and Curriculum for Special-Needs Students** (3) Ives, Staff
Review of the basic curriculum areas as they relate to the development of readiness skills in special education. (Spring, alternate years)

271 **The Interdisciplinary Approach to Planning for the Special-Needs Child** (3 or 6) Freund
Theory of interdisciplinary team functioning. (Spring)

280 **Developmental Assessment for Adolescents** (3) Staff
Formal and informal psychoeducational assessment instruments commonly used with upper-elementary and junior and senior high school students, along with the writing of psychoeducational reports. Material fee, $25. (Fall)

287 **Interdisciplinary Topics Related to the Seriously Emotionally Disturbed Adolescent** (3) Ives
Examination of the multidisciplinary roles of the transition special educator of seriously emotionally disturbed adolescents. Goals of the transition process and issues and concerns relevant to the transition of emotionally disturbed adolescents from one level of service to another. (Spring)

288 **Psychoeducational Characteristics of the Seriously Emotionally Disturbed Adolescent** (3) Staff
An in-depth examination of relevant diagnostic categories, psychosocial development issues, and the nature and needs of the seriously disturbed adolescent. (Fall)

289 **Curriculum Methods for the Seriously Emotionally Disturbed Adolescent** (3 to 6) Ives
Design and implementation of appropriate educational and management plans, under the supervision of the instructor in a field-based practicum experience. (Spring and summer)

290 **Affective Development and Behavior Management in Special Education** (3) Castleberry
Theory, programming, and behavior management strategies from theoretical and practical points of view. Material fee, $25. (Spring)

291 **Behavior Management Practicum: The Seriously Emotionally Disturbed Adolescent** (3) Ives
Examination of a comprehensive program and specific management strategies for classroom control. (Spring)

292 **Professional Internship in Education of Young Exceptional Children** (6 or 9) Staff
Supervised internship in the education of young exceptional children. A minimum of 420 clock hours required. (Spring and summer)

293 **Professional Internship for the Special Educator** (3 to 9) Freund, Castleberry
Supervised internship in the multidimensional aspects of work within the special education continuum. Material fee, $25. (Spring and summer)

294 **Professional Internship: Service to the Seriously Emotionally Disturbed Adolescent** (6 to 9) Ives, Sobel
Full-time placement as a psychoeducator in a residential or extended day-care site. (Spring)

295 **Professional Internship in Supportive Training, Transition, and Education Programs** (3 to 9) Ianacone
Supervised internship focused on providing supportive training, transition, and education experiences for handicapped individuals. Emphasis on diversified cooperative and interagency programming efforts. 140–420 clock hours required. (Fall, spring, and summer)

296 **Philosophical, Legal, and Practical Issues in the Implementation of Public Law 94-142** (3) Shotel
Historical and legal perspectives that have led to Public Law 94-142, the Education for All Handicapped Children Act of 1975, and the consequences of this act on public school service delivery systems. Emphasis on the present and future impact of this law and its interpretation on the regular class teacher and administrator and on their roles within a public school system. (Summer)

297–98 **Research and Independent Study** (3–3) Staff
Individual study or research under guidance of staff member. Program and conferences arranged with advisor. Admission by permission of advisor. May be repeated for credit. (Academic year)

**Fourth Group**

301 **Doctoral Seminar in Special Education** (arr.) Staff
*(Formerly SpEd 401)*
Participation in a small group with a selected faculty member; intensive study and discussion of an area of common interest in an informal environment providing for the exchange of ideas and optimum potential for personal and professional growth. Admission by permission of instructor. (Spring)

303 **Administration and Supervision of Special Education** (3) Ives, Castleberry
Philosophy and nature of special education; program organization, administration, and development. Surveying local needs; program evaluation and supervision. Admission by permission of instructor. (Summer)

304 **Recent Research and Trends in Special Education** (3) Ianacone, Freund
Emphasis on topical research issues and concerns, unique problems of conducting research, and procedures and sources for obtaining research funding. Material fee, $25. (Fall and spring)

306 **Dynamics of Family Intervention: Theory and Practice in Special Education** (3) Ives, Freund
Theoretical foundations and clinical techniques necessary for the early special educator to counsel parents of handicapped students. Material fee $25. (Spring)

308 **Instructional Processes in Teacher Preparation and Special Education** (3) Ives
Review of instructional processes as they affect education and special education, including the university and staff development perspective; opportunities for practice in needs assessment, program design, and instruction. Admission by permission of instructor. (Fall)

343 **Psychoeducational Diagnosis in Special Education** (3) Staff
The range of diagnostic strategies applicable to the child who presents psychosocial and related learning difficulties. Admission by permission of instructor. (Spring)

345 **Consultation Skills in Teacher Preparation and Special Education** (3) Ives, Shotel
Consultation models from organizational development, organizational psychology, and mental health applied to in-service training for educational

personnel and programs for the special child in the public schools. Material fee, $25. (Spring)

351 **Seminar: Developing Home/School/Community Support Systems—Models for Effective Service Delivery** (3) Sobel, Ives
Provides experiences that facilitate effective service planning for the handicapped child through the examination of existing models of family intervention, curriculum adjustment, and special education service delivery. (Spring)

352 **Seminar: Legal Issues and Public Policy Concerns for Individuals Who Are Handicapped** (3) Staff
Identification and examination of policy issues: procedures involved in moving an area of concern into the political and legislative process; the role of agencies and advocacy groups in defining and shaping regulatory and implementation criteria into a legal mandate. (Summer)

353 **Post-Master's Internship in Special Education** (3 to 6) Staff
Supervised professional internship in college teaching, administration, supervision, or private-agency function. Internships are individually arranged. Admission by permission of instructor. (Fall and spring)

354 **Doctoral Internship: Special Education** (6) Staff
*(Formerly SpEd 453)*
Supervised professional internship in college teaching, administration, supervision, or private agency function. Each internship is individually arranged. Admission by permission of advisor. (Fall and spring)

360 **Interdisciplinary Techniques in the Diagnostic Process in Special Education** (3) Rosegrant
Application of theoretical concepts of assessment; development of assessment programs; interpretation and application of interdisciplinary diagnostic evaluations. Prerequisite: SpEd 260 or equivalent, and permission of instructor. (Fall)

370 **Interpersonal Dynamics in Teacher Preparation and Special Education** (3) Ives
Attitude change and the access process. Applies specific psychosocial constructs germane to successful interaction to the milieu of the special education consultant-administrator. Material fee, $25. (Fall)

373 **Pre-Service Teacher Education** (3) Staff
*(Formerly Educ 273)*
Program development, governance, issues, trends. (Fall, alternate years)

374 **In-Service Planning and Programming** (3) Staff
*(Formerly Educ 274)*
Continuing professional development of educators, costs and benefits to society, programs and practices, current issues. (Spring, alternate years)

390 **Departmental Seminar in Special Education** (3) Shotel
*(Formerly SpEd 490)*
Provides an opportunity for selected graduate students to develop, refine, and demonstrate their skills and abilities in a small-group setting with fellow students and department faculty. Admission by permission of instructor. (Fall)

391 **Dissertation Research** (arr.) Staff
*(Formerly SpEd 491)*

## TELECOMMUNICATIONS POLICY—GRADUATE PROGRAM

Professor C.H. Sterling *(Academic Director)*
Associate Professor T.J. Brennan

The Graduate School of Arts and Sciences offers a multidisciplinary program leading to the degree of Master of Arts in the field of public policy with a concentration in telecommunications policy. The program focuses on the interaction among politics, economics, and technology in both corporate strategy and governmental policy-making.

*Master of Arts in the field of public policy with a concentration in telecommunications policy*—Prerequisite: a bachelor's degree with a *B* average from an accredited college or university.

Required: the general requirements stated under the Graduate School of Arts and Sciences, including 36 semester hours of course work. The required core courses are Econ 217; PSc 203; and Psyc 244. Required courses for the field of study are Econ 249, EE 450 (*Telecommunication Systems Concepts*), 451 (*Survey of Telecommunication Systems*); TCom 240, 241; and four elective courses selected in consultation with the academic director. Each student must pass a Master's Comprehensive Examination.

220 **Technology and Telecommunications Policy** (3)
National and international policy issues that arise from interaction between scientific and technological development in telecommunications and government policies.

240 **Seminar in Telecommunications Policy** (3)
Techniques for assessing institutions and policy in domestic U.S. telecommunications, including local and long distance carriers and their regulation, spectrum utilization, mobile satellite and terrestrial services, electronic media issues, government telecommunication systems, the interface with international policies, and the general policy shift to deregulation. Prerequisite: Econ 217; PSc 203.

241 **Seminar in International Telecommunications Policy** (3)
Techniques for assessing the role and process of international telecommunications organizations, U.S. policy-making for the international sphere, system authorization and utilization issues, transborder data flow and the New World Information Order, barriers to trade in information equipment and services, the regional facilities planning process, and development of competition in international telecommunications. Prerequisite: Econ 217; PSc 203

298 **Independent Study** (1 to 3)

## THEATRE AND DANCE

*Associate Professors* N.D. Johnson, A.G. Wade *(Chair)*, M.R. Withers, N.C. Garner, L.B. Jacobson
*Assistant Professors* B.W. Sabelli, W.A. Pucilowsky
*Lecturer* M.K. Grut

*Bachelor of Arts with a major in theatre (departmental)*—The following requirements must be fulfilled:

1. The general requirements stated under Columbian College of Arts and Sciences.
2. Required courses in related areas—24 semester hours of second-group courses outside the Department of Theatre and Dance, as approved by the major advisor (including 12 semester hours in dramatic literature.)
3. Required courses in the major—TrDa 114, 130, 131, 136, 145–146, 147; 15 additional semester hours in second-group theatre courses.

*Bachelor of Arts with a major in dance (departmental)*—The following requirements must be fulfilled for this 123-semester-hour program:

1. The general requirements stated under Columbian College of Arts and Sciences. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initation in the social sciences and the natural and mathematical sciences.)
2. Required courses in related areas: Mus 3–4; TrDa 45, 130, 131.
3. Twelve additional semester hours in the humanities outside the Department of Theatre and Dance.
4. Required courses in the major: TrDa 160–61, 162–63, 164–65, 170–71, 172–73, 174–75, 180–81, 182–83, 184–85, 186–87, 188–89, 190–91, 192, 193–94, 199 (placement in second-group technique courses is determined by audition).
5. At the beginning of the senior year, all dance majors undertake a project in a special area of interest under the supervision of one or more faculty members.

**Minor in Theatre—18 semester hours of theatre courses, including TrDa 145–146.**

**Minors in Dance—**

1. *Dance and Dancing:* **6 semester hours from TrDa 160–61, 162–63, 164–65, 170–71, 172–73, 174–75, 192, 193–94; 6 semester hours from TrDa 180–81, 182–83, 184–85; and 6 semester hours from TrDa 186–87, 188–89, 190–91.**

2. *Dance History and Criticism:* **6 semester hours from TrDa 160–61, 162–63, 164–65, 170–71, 172–73, 174–75, 193–94; 12 semester hours from TrDa 150, 151, 153, 188–89, 190–91.**

3. *Dance Education:* 6 semester hours from TrDa 160–61, 162–63, 164–65, 170–71, 172–73, 174–75, 193–94; 6 semester hours from TrDa 180, 182 or 183, 184, 188, 190 or 191; 6 semester hours from TrDa 154, 155, or 156.

**Master of Fine Arts in the field of theatre—Prerequisite: the degree of Bachelor of Arts from this University, or an equivalent degree.**

Required: the general requirements stated under the Graduate School of Arts and Sciences.

For the concentration in theatre design, the program of study consists of 54 semester hours of second- and third-group course work in theatre and dance and in art, planned in consultation with the advisor, including a creative thesis (equivalent to 6 semester hours).

For the concentration in dance, the program of study consists of 36 semester hours of second- and third-group course work in theatre and dance and in related arts, planned in consultation with the advisor, including a creative thesis.

**First Group**

First-group courses are primarily for nonmajors.

45 **Understanding the Theatre** (3) Sabelli
The art of the theatre: its literature, architecture, aesthetics, and mechanics. Contributions of the playwright, actor, director, and designer. Attendance at theatrical performances and presentations by visiting artists. (Fall and spring)

46 **Understanding the Dance** (3) Johnson
Survey of multiple styles of dance and the relationship of dance to culture and society through the ages. Opportunities to experience dance forms through participation, viewing videotapes and films, and attending theatrical performances. (Fall and spring)

50 **Beginning Ballet** (1) Staff

51 **Beginning/Intermediate Ballet** (1) Staff

52 **Beginning Modern Dance** (1) Staff

53 **Beginning/Intermediate Modern Dance** (1) Staff

54 **Beginning Jazz** (1) Staff

55 **Beginning/Intermediate Jazz** (1) Staff

56 **Beginning Tap** (1) Staff

57 **Beginning/Intermediate Tap** (1) Staff

58 **Beginning Spanish Dance** (1) Staff

59 **Beginning/Intermediate Spanish Dance** (1) Grut

60 **Beginning Dance: Ethnic Forms** (1) Grut

61 **Beginning/Intermediate Dance: Ethnic Forms** (1) Staff

62 **Beginning Ballroom Dance** (1) Staff

63 **Beginning/Intermediate Ballroom Dance** (1) Staff

64 **Beginning Folk Dance** (1) Johnson

65 **Beginning/Intermediate Folk Dance (1)** Staff

**Second Group**

105 **Intermediate Playwriting I (3)** Claeyssens
Same as Engl 105.

108 **Intermediate Playwriting II** (3) Claeyssens
Same as Engl 108.

112 **Voice for the Theatre** (3) Jacobson
*(Formerly TrDa 113)*
The practice and application of voice production with reference to skeletal alignment, breathing, resonance, and articulation. Emphasis is placed on individual awareness of the process of voice production and its application to performance. Prerequisite: SpHr 11 (for theatre majors) or permission of the instructor. (Fall)

113 **Special Problems in Speech for the Actor** (3) Jacobson
*(Formerly TrDa 213)*
Vocal production related to interpretation of specific texts. Focus on stage dialects and the interpretation of Shakespeare. Prerequisite: TrDa 112. (Spring)

114 **Introduction to Acting** (3) Garner, Jacobson, Wade
Basic techniques of concentration, imagination, improvisation, and character analysis. (Fall and spring)

115 **Beginning Scene Study** (3) Garner, Jacobson
Principles of role development, concentrating on 20th-century material. Prerequisite: TrDa 114. (Fall and spring)

116 **Scene Study: Modern Comedy** (3) Garner
Principles of role development, comic timing, and stage business, concentrating on material by contemporary playwrights, such as Neil Simon. Prerequisite: TrDa 114. (Fall, even years)

117 **Audition Techniques** (3) Jacobson
*(Formerly 1 credit)*
All aspects of the audition process: selection and rehearsal of audition monologues, handling of cold reading, etc. Prerequisite: TrDa 115 or equivalent. (Spring, odd years)

122 **Scene Study: Classical Drama** (3) Garner
Principles of role development and handling of verse dialogue, concentrating on classical Greek and Shakespearian drama. Prerequisite: TrDa 115. (Fall, odd years)

123 **Scene Study: Classical Comedy** (3) Jacobson
Principles of role development, concentrating on material from the English Restoration, Molière, and other 17th- and 18th-century playwrights. Prerequisite: TrDa 115. (Spring, even years)

130 **Theatre Production** (3) Staff
Theories and practicum in theatre and dance production, including acting or dance, stage management, costume and set construction, rigging, lighting, sound, makeup, business management, and publicity, with specific emphasis in at least one area. May be repeated once for credit. (Fall and spring)

131 **Introduction to Lighting** (3) Staff
Lecture (2 hours), laboratory (1 hour). Theories and practicum in lighting for theatre and dance. Laboratory fee, $15. (Fall)

132 **Makeup Design** (3) Puciłowsky
Theory and practicum in the art of makeup design, including latex and crepe hair. (Fall)

133 **Stage Management** (1) Staff
Fundamental study of stage management with emphasis on practical production work as well as theory.

134 **Theatre Architecture** (1) Sebelius
Study of general principles, theories, and styles of theatre architecture.

135 **Scene Design** (3) Sebelius
Fundamental study of scenography, including drafting, scene painting, rendering, stage properties, and model construction. (Fall, odd years)

136 **Costume History and Construction** (3) Puciłowsky
History of fashion in Western civilization from ancient Greece to the 20th century. Fundamental study of costume research through specific projects. Costume construction. (Fall)

140 **Anthropology, Drama, and the Human Experience** (3) Garner, Allen
A comparative approach to the meaning of humanity in different cultural traditions. Examination of the role of drama in daily life in its secular and ritual forms and contexts in which it is developed for conscious goals. Through improvisation workshops, students explore how the techniques of anthropology and drama can lead to a better understanding of the significance of specific actions and events and of human experience. Same as Anth 154. (Spring)

143 **Theatre in Washington** (3) Garner
An introduction to the artistic philosophies, organization, and operation of professional and semiprofessional theatres in Washington. Attendance at production is required. Lectures and discussions focus on performances and operations of the theatres. (Summer)

145–46 **History of the Theatre** (3–3) Pucilowsky
An examination of the development and growth of the theatre from the beginnings to the present. TrDa 145: Greek through English Renaissance. TrDa 146: French Neoclassic to the early 20th century. (Academic year)

147 **Directing for the Theatre** (3) Garner
Fundamentals of script analysis, casting, and rehearsal techniques. Prerequisite: TrDa 114, 145, and 146. Laboratory fee, $15. (Fall)

148 **Musical Theatre** (3 or 6) Jacobson, Sabelli, Pucilowsky
Growth of American musical theatre. Development of all its components: libretto, dance, composition, lyrics, and the overall fabric of productions. Principles of design for musical theatre, including practical applications. (Summer)

151 **Ballet—The Illusive Art** (3) Johnson
The art of ballet; its history, aesthetics, and performance. Contributions of the choreographer and performer are examined through lectures, class discussions, readings, and presentations by guest lecturers. Attendance at theatrical performances and videotape/film showings. Primarily for nonmajors. Prerequisite for nonmajors: TrDa 46.

152 **Dance in the 20th Century** (3) Withers
Development of dance as an art form. Understanding the processes of creating dance. Improvisation, composition, choreography, and collaboration are examined. Participatory experiences. Primarily for nonmajors. Prerequisite for nonmajors: TrDa 46.

153 **Dance Aesthetics and Criticism** (3) Johnson
Theories related to dance as an art form and their application to dance criticism. Viewing of videotapes and films and attendance at theatrical performances. Prerequisite for nonmajors: TrDa 46.

154 **Creative Dance for Children** (3) Withers
Dance as an expressive art medium for children: concepts, principles, methods, and materials.

155 **Social and Recreational Forms of Dance** (3) Johnson
The application of theories and teaching concepts to social and recreational forms of dance.

156 **Dance Pedagogy** (3) Johnson
Philosophy, concepts, methods, materials, and organizational approaches to teaching dance in academic and nonacademic settings. Prerequisite: TrDa 186–87.

160–61 **Intermediate Ballet** (2–2)
Admission by audition; may be repeated for credit.

162–63 **Intermediate/Advanced Ballet** (2–2)
Admission by audition; may be repeated for credit.

164–65 **Advanced Ballet** (2–2)
Admission by audition; may be repeated for credit.

170–71 **Intermediate Modern Dance** (2–2)
Admission by audition; may be repeated for credit.

172–73 **Intermediate/Advanced Modern Dance** (2–2)
Admission by audition; may be repeated for credit.

174–75 **Advanced Modern Dance** (2–2)
Admission by audition; may be repeated for credit. Staff

180–81 **Movement Improvisation for Theatre and Dance** (3–3)
Awareness of body movement, environment, group dynamics, performance and composition through improvisational techniques. Withers

182–83 **Dance Composition** (3–3)
TrDa 182: Basic elements and principles of composition. TrDa 183: Advanced problems in composition. Prerequisite: TrDa 180–81 or equivalent. (Academic year) Withers

184–85 **Choreography** (3–3)
The creation of a dance performance with reference to staging aspects. Prerequisite: TrDa 180–81, 192–93, or equivalent; TrDa 131 recommended. (Academic year) Withers

186–87 **Body Alignment and Movement Theory** (3–3)
Application of principles of anatomy, kinesiology, and physics to the analysis and practice of contemporary dance techniques. (Academic year)

188–89 **Movement Analysis** (3–3)
Concepts and principles of movement analysis with emphasis on Laban's principles of effort/shape. Johnson

190–91 **Dance History** (3–3)
History of dance from antiquity to present; emphasis on cultural significance of dance as art, education, and social behavior. Prerequisite for nonmajors: TrDa 46. (Academic year) Staff

192 **Repertory/Performance** (1)
Participation in the processes of learning dance repertory and performing dance works. Audition required. May be repeated for credit. (Academic year) Staff

193–94 **Dance Styles** (arr.)
Forms of theatrical dance other than ballet or modern. (Academic year) Staff

196 **Independent Study** (1 to 6)
Independent research and special projects. Open to seniors or exceptionally well-prepared juniors majoring in theatre or dance. Before students are permitted to register for TrDa 196, they must submit a written proposal of the plan of study and obtain approval of the staff member who will be directing the study and the department chair.

199 **Senior Project** (3)
Open to seniors majoring in theatre or dance. Before students are permitted to register for TrDa 199, they must submit a written proposal of the plan of study and obtain approval of the faculty member who will be directing the study and the department chair.

**Third Group**
Prerequisite to all third-group courses: M.F.A. candidacy or permission of instructor

203 **Professional Literature** (3)
Survey of the literature of the field, including print and media materials. Johnson

207 **Trends in Contemporary Performance** (3)
Study and discussion of current work in performance. Guest lectures and field study. Emphasis on individual projects. Withers

231 **Lighting Design** (3)
Theory and execution of lighting design for theatre and dance. Prerequisite: TrDa 131. Staff

234 **Advanced Scene Design** (3)
Preparation for the advanced student designer, with emphasis on the individual development of rendering techniques, technical drafting, traditional script analysis, and original scenographic interpretations. May be repeated once for credit (Fall) Sabo

235 **Special Projects in Scene Design** (3) Sabelli
Exploration of all styles of traditional and contemporary scenography through the making of scale models. May be repeated once for credit. Admission by permission of instructor. (Spring)

236 **Costume Design** (3) Pucilowsky
Introduction to the basic techniques of costume design through specific projects. Various rendering techniques will be explored, consistent with the historical period concerned. Prerequisite: TrDa 136. (Spring, odd years)

237 **Advanced Costume Design** (3) Pucilowsky
Study of special design, style, and construction problems. (Spring)

238 **Pattern Making** (3) Pucilowsky
The study of pattern drafting and draping methods, based on contemporary and historical clothing, through lecture and class work. Prerequisite: TrDa 136. (Spring, even years)

250 **Advanced Dance Technique** (2) Staff
Advanced study in selected styles: ballet, modern, Spanish. May be repeated for credit.

252 **Advanced Dance Composition** (3) Withers
Elements of dance composition explored through improvisation, short movement studies, and dances that are presented, discussed, and reworked. May be repeated for credit.

255 **Choreographic Projects** (1 to 3) Withers
Original dances are created or dances are reconstructed for performance under the guidance of dance faculty. May be repeated for credit.

260 **Special Studies in Dance Video** (3) Withers
Review of existing art works of dance/video and dance/film for content and television production techniques. Emphasis on projects in-studio and with VHS and professional equipment. Lecture and laboratory.

270 **Aesthetics and Criticism** (3) Johnson
Examination of aesthetic theories of dance as a performing art, with application to criticism.

290 **Workshop** (1 to 3) Staff
Workshops with emphasis on contemporary issues and problems. Development of advanced professional competencies. Experts in short/intensive periods. May be repeated for credit.

291 **Internship** (1 to 6) Staff
Internships with dance and theatre companies or arts organizations, including conference and/or seminar. May be repeated for a total of six semester hours.

292 **Selected Topics in Theatre and Dance** (1 to 3) Staff
May be repeated for credit.

294 **Independent Research in Theatre** (arr.) Staff
May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

## UNIVERSITY PROFESSORS

University Professors M. Cunliffe, A. Etzioni, P.J. Caws, S.H. Nasr, A. Zwerdling

Courses numbered in the 770s are taught by distinguished scholars who hold appointments as University Professors. With the approval of the department or program concerned, appropriate University Professor courses may be taken to satisfy degree program requirements. Permission of the University Professor may be required for enrollment. A complete listing of courses offered each semester appears in the *Schedule of Classes* under the 700 series. Following is a list of courses that are expected to be taught fairly regularly by University Professors.

AmCv/Hist

771 **American Intellectual History: The Idea of Private Property** (3) Cunliffe
American debates over private property, from the 17th century to the present day. Applications in legal, economic, political, and social thought and in imaginative literature. Entitlements and limits, land claims, slavery, women's property, copyright, inheritances, the individual in relation to the community and the state.

AmCv/Engl/Hist

772 **American Intellectual History: The James Family** (3) Cunliffe
A consideration of one of America's most brilliant "clans," c. 1840–1920. Henry James, Sr., cosmopolite and Swedenborgian reformer, and three of his children—the novelist Henry James, Jr., the psychologist–philosopher William James, and their diarist–sister Alice James. Their writings will be examined in several contexts, including literary criticism, feminism, and psychohistory. Open to undergraduates and graduate students.

AmCv/Hist

773 **Republicanism in America** (3) Cunliffe
Republicanism as an ideology; historical antecedents in the Old World and their transit to North America; the repudiation of monarchy in 1776; the development and significance of republicanism in 19th-century America (with some comparative emphasis, especially on Latin America, France, and Britain); and the eventual loss of ideological vitality. For juniors and seniors; open to graduate students.

AmCv/Engl/Hist

774 **The History of Heroism** (3) Cunliffe
Interpretations of heroism, greatness, and genius since ancient times, with particular emphasis on 18th- to 20th-century conceptions. Hegelian, Marxist, and other theories of the role of the individual in affecting the course of history. The functions of biography, from hagiology to psychohistory, as a literary–historical genre. For juniors and seniors; open to graduate students.

AmCv/Engl

775 **The Great Popular Author in Britain and America, 1800–1915** (3) Cunliffe
The emergence of imaginative writers (Scott, Thackeray, Dickens, Twain, Kipling) who were both highly and widely admired for combining entertainment and moral edification. Subsidiary attention to European "giants" (Hugo, George Sand). The sociology of 19th-century authorship: periodicals, publishers, reviewing, translation, copyright, platform appearances; fecundity and versatility. Prerequisite: permission of the instructor. For graduate students; open to qualified undergraduates.

Engl/AmCv

771 **American Literary Expatriates** (3) Zwerdling
Why so many important American writers of the past century—James, Wharton, Eliot, Pound, Stein, Hemingway, Fitzgerald, Plath, and others—chose to leave their native country and live in London or Paris. What attracted them to Europe and how their expatriation affected their work. For undergraduates; open to graduate students.

Engl

772 **Literature and Politics** (3) Zwerdling
The role of writers in working for political and social change. Writing for a cause: to bear witness, to protest, to expose, to describe political action. Literature and propaganda; conservative and radical writing; the choice of fiction, drama, documentary, essay, or fable; the writer's ability to help effect social change. For undergraduates; open to graduate students.

Phil

774 **Understanding Technology** (3) Cavey
An examination of the idea of technology—its relations to the sciences and the arts and humanities, its development, and its problems. Technology will not be regarded as merely dependent on the sciences or as merely useful (or

dangerous); it will be regarded as a human activity in its own right, with its own history, conceptual structure, interests, risks, and benefits. For under-
Phil graduates; open to graduate students.

778 **Left and Right in Philosophy and Politics** (3) Caws
A fundamental inquiry, drawing on philosophy and the social sciences, into the concept of the state in terms of entrenched oppositions: individualism/collectivism, equality/liberty, liberalism/conservatism, socialism/free enterprise, communism/capitalism. Emphasis on the present need to find a constructive transcendence of these oppositions. Readings from Plato, Hobbes, Locke, Hegel, Marx, Freud, Levi-Strauss, Walzer, Nozick, and others.
Phil For undergraduates; open to graduate students.

779 **Philosophy and Psychoanalysis** (3) Caws
An exploration of some striking parallels between the topics addressed by Freud's psychoanalytic theories on the one hand and the traditional content of philosophical reflection on the other, with special emphasis on the relation between cognitive theory and therapeutic practice (in both disciplines). For
Rel undergraduates; open to graduate students.

770 **Islamic Civilization and the West** (3) Nasr
The encounter of Islam and the West, from the rise of Islam to modern times. Investigation of the impact of Islam on European philosophy, science, art, and literature; the impact of the image of Islam as shown in modern Western
Rel scholarship upon the Islamic world. For juniors and seniors; open to graduate students.

771 **Persian Sufi Literature in East and West** (3) Nasr
The writings of major Persian Sufi poets and writers, such as Khayyam, Attar, Rumi, Shabistari, and Hafiz, and their impact in the West and in India. The translation of these works into European languages and their influence upon
Rel such figures as Goethe and Emerson are discussed. Assigned readings in English. For undergraduates; open to graduate students.

772 **Mysticism—East and West** (3) Nasr
A thematic examination of major elements and components of mystical traditions, dealing with such issues as the nature of mysticism, the search for ultimate reality, the mystical significance of the cosmos, the mystical science of the soul, and the significance of sacred art and symbols. Major mystical
Rel traditions of East and West—Hinduism, Taoism, Buddhism, Judaism, Christianity, Islam.

777 **Religion and Science** (3) Nasr
The interaction between religion and science in different civilizations. This relationship in ancient Egypt, classical Greece, Islam, India, China, and the West, from the Renaissance, the scientific revolution, and up to the present day. Key concepts and issues in the encounter of religion and science are
Soc considered in light of the cultural matrix of the civilization and period in question. For juniors and seniors; open to graduate students.

776 **Public Policy Research** (3) Etzioni
Basic concepts of policy research in comparison to basic and applied research. Policy research methods. The social structure of policy research: producers and consumers of knowledge and issues arising among them. Open to undergraduates and graduate students with permission of the instructor. Prerequisite: social science or public policy course work or related experience.

Soc/PSc Etzioni

777 **Contemporary American Society** (3)
A social science perspective of American society and its main institutions and dynamics. Analysis of the concepts that allow continued insight into America's condition and its future. For undergraduates; open to graduate students.

Soc/Econ/PSc Etzioni

779 **The Elements of Socioeconomics** (3)
A synthesized approach to the study of economic behavior and economic policy, drawing on relevant segments of economics and sociology as well as political science and psychology. A discussion of ethical assumptions and core concepts in the study of micro- and macroeconomic behavior and their policy implications. For graduate students; open to qualified undergraduates.

## URBAN AND REGIONAL PLANNING

*Professors* D.C. McGrath, Jr., S.S. Fuller *(Chair)*, S. Greene
*Adjunct Professor* F. Gutheim
*Associate Professors* D.E. Gale, R.W. Longstreth
*Associate Professorial Lecturer* J.L. Preston
*Assistant Professorial Lecturer* M.K. O'Bryon
*Lecturer* O.T. Carr, Jr. *(Visiting)*

See the School of Government and Business Administration for the program of study leading to the degree of Master of Urban and Regional Planning, which provides preparation for professional practice in the planning field, and areas of specialization in planning as components of programs leading to the degrees of Master of Public Administration and Doctor of Philosophy.

### First Group

50 **Washington, D.C.: History, Culture, and Politics** (3) Gillette and Interdisciplinary Team
Same as AmCv/Hist/PSc 50.

### Second Group

Greene

153 **Fundamentals of Urban Planning and Design** (3)
Studio course for undergraduates. Basic elements of urban planning and design applied to community problems. Survey of planner's role in developing and implementing creative solutions to urban problems. (Spring)

Gale

154 **Survey of American Urban and Regional Planning** (3)
Examination of the historical roots, recent trends, issues, and new directions of American planning concepts, as well as the social and political forces that shape the character of planning in the United States. The roles of institutions, politicians, planners, and the general public in the planning process. Particular emphasis is placed on urban planning at the local governmental level. (Fall)

Longstreth

175–76 **American Architecture** (3–3)
Joint offering of the Urban and Regional Planning Department and the American Studies Program. Examination of selected topics in American architecture from the 17th century to the present. Stylistic properties, form, type characteristics, technological developments, and urbanistic patterns are introduced as a means of interpretation of historic meaning. Buildings are analyzed both as artifacts and as signifiers of social, cultural, and economic tendencies. U&RP/AmCv 175: 1600–1860; U&RP/AmCv 176: 1860–present.

Gale

Same as Art 176 and 191. (Academic year)

177 **Introduction to Historic Preservation** (3)
Washington, D.C., is the primary setting for the study of historic preservation as it has developed over the past century. Experience with preservation issues

as shown by examples in other locations will also be discussed. Lectures, class discussions of the readings, and field trips to neighborhoods and sites subject to preservation efforts. Same as AmCv 177. (Spring)

**Third Group**

201 **Planning Theory and Practice I** (3) Gale
Introduction to the development of urbanization and urban settlements in the United States, the emergence and growth of urban and regional planning, and the evolution of issues in the practice of the planning profession. (Fall)

202 **Planning Theory and Practice II** (3) Gale
Introduction to the concepts of planning, plan making, and plan implementation. Examination of the relationship between theory and practice in planning. Discussion of the role of reconnaissance studies, goal formulation, technological forecasting, and scenario development in planning practice. Prerequisite: U&RP 201 or permission of instructor. (Spring)

203 **Principles of Community Planning and Design** (4) Greene
Planning and design studio to develop and apply planning methods and graphic techniques; principles of land use and community design; analysis of factors affecting community development and change. Open only to candidates for the degree of Master of Urban and Regional Planning. Laboratory fee, $20. Prerequisite: U&RP 201 or permission of instructor. (Fall)

207 **Land Development Planning** (3) McGrath
Selected problems in urban and regional planning: applications of zoning, environmental controls, tax incentives, and other techniques available for the implementation of development plans. Prerequisite: U&RP 201 or permission of instructor. (Fall)

208 **Land Use and Urban Transportation Planning** (3) McGrath
Relationships between land use and the movement of goods and people. Examination of land use and transportation planning principles, issues, and techniques. Roles of public and private interests in land use and transportation planning and management. Prerequisite: U&RP 201 or permission of instructor. (Spring)

210 **Urban Development Economics** (3) Fuller
Economic forces affecting urban growth and change; relationships among cities, metropolitan areas, and regions in the context of the national economy; socioeconomic implications of urban land development policies; basic studies and methods of economic analysis. Prerequisite: Econ 217–18 or equivalent or permission of instructor. (Fall)

211 **Methods of Urban and Regional Analysis I** (3) Preston
Study of basic statistical procedures and their interpretations, introduction to research methods and data collection and management, microcomputer operations and statistical problem solutions. This course establishes a computer capability that the student utilizes subsequently in all course assignments. (Fall)

212 **Methods of Urban and Regional Analysis II** (3) Fuller
Introduction to methods used to analyze, estimate, and forecast population, employment, income, and economic growth and development. Includes cohort survival, location quotients, survey sampling and questionnaire design, shift-share, and case study methods. Prerequisite: U&RP 211. (Spring)

215 **Advanced Planning Problems** (4) McGrath
Investigation of complex problems of the metropolitan region, analysis of findings, formulation of proposals, and presentation of material to faculty and cooperating groups. Multidisciplinary team and individual planning projects. Studio course. Laboratory fee, $20. Prerequisite: U&RP 203 or permission of instructor. (Fall)

218 **Metropolitan and Regional Planning** (3) Fuller
Multidisciplinary study of the methods of regional analysis and process of

regional planning; development of projects of regional scale requiring problem analysis, synthesis, and plan formulation. Studio course. Laboratory fee, $20. Prerequisite: U&RP 203 and 212 or permission of instructor. (Spring) McGrath

241 **Federal and State Urban Policy Development** (3)
Investigation of contemporary trends in the evolution of federal and state governmental functions and programs affecting urban growth and development policy. Planning functions in evolving relationships among units of federal, state, and metropolitan agencies. Prerequisite: U&RP 201 or permission of instructor. (Spring) Staff

242 **International Urban Planning** (3)
Examination and comparison of the theories of and approaches to urban planning in various countries. Analysis of the types of planning and development techniques employed and their effectiveness. Applicability of such approaches and methods within the context of the American urban planning process. Prerequisite: U&RP 201 or permission of instructor. (Fall) Gale

251 **Housing and Community Development: Concepts and Methods** (3)
An examination of the basic theories, concepts, principles, and analytical methods for managing the planning process by which cities approach the resolution of their development and housing needs. Housing supply and demand conditions, market analysis, physical inventory methods, community facility planning and impact analysis, commercial revitalization, and neighborhood theory and dynamics. Prerequisite: U&RP 201 or permission of instructor. (Fall) Gale

252 **Housing and Community Development: Case Studies and Applications** (3)
The application of theory and methodology to contemporary housing and community development issues. Examination of federal policies and programs, community facilities, redevelopment and adaptive reuse projects, and the role of the private sector. Case studies and field trips. Prerequisite: U&RP 251 or permission of instructor. (Spring) Fuller

255 **Urban Housing** (3)
Principal issues affecting the demand for and supply of housing, including home financing, housing costs, tenure options, rehabilitation and conservation, market dynamics and requirements, and public-sector involvement. Prerequisite: U&RP 251 or permission of instructor. (Summer) Gale

256 **Neighborhood Dynamics** (3)
Residential location decisions as they affect land use in metropolitan areas. Middle class, elderly, and minority mobility patterns. Effects of discrimination, dislocation, condominiums, and historic preservation. Prerequisite: U&RP 201 or permission of instructor. (Summer) Gale

257 **Fiscal Policy and Urban Planning** (3)
Consideration of municipal fiscal conditions and their implications for urban planning. Examination of capital projects financing, tax policy and land use, and fiscal impact analysis of urban development. Prerequisite: U&RP 201 or permission of instructor. (Fall) Gale

258 **Advanced Urban Development Economics** (3)
Analysis of case studies of large-scale development projects to gain comprehension of financial, political, legal, and technical complexities and constraints inherent in the urban development process. Prerequisite: U&RP 251 or permission of instructor. (Fall) Fuller

259 **Economic, Social, and Legal Aspects of Urban Development** (3)
Same as BAd 225. Examination of the forces that shape urban development; introduction to market analysis methods and techniques to evaluate project feasibility; study of the institutional and legal framework within which urban development occurs and that influences controls, land value, and development potential; and analysis of roles and responsibilities of the public and private sector in the urban development process. (Fall)

261 **Community Planning and Design: Concepts and Methods** (3) Greene
Investigation of perceptual, social, physical, and aesthetic factors in planning and design. Emphasis on interaction of users and the environment, principles and process of community design, visual analysis, evaluation and implementation techniques. Prerequisite: U&RP 203 or permission of instructor. (Fall)

262 **Community Planning and Design: Case Studies and Applications** (3) Greene
Planning and design studio; application of community design principles and process to typical problems of community change and development. Laboratory fee, $20. Prerequisite: U&RP 261 or permission of instructor. (Spring)

263 **Community Preservation and Design Studio** (3) Greene
Interdisciplinary studio class: application of the techniques and methods of historic preservation, urban planning, housing and community development, community design, and other disciplines to problems of revitalizing urban areas. Surveys, inventories, analyses, formulation of proposals, and presentation to faculty and cooperating groups. Laboratory fee, $20. Prerequisite: U&RP 201 or permission of instructor. (Summer)

264 **Urban Development Planning and Design** (3) Greene
Same as BAd 228. Application of planning design principles and techniques in a studio laboratory environment. Field reconnaisance and graphic techniques applied to projects in site selection, site analysis, concept formulation, and site planning in an urban context. Public and private sector issues are addressed in the preparation of a project development proposal. Prerequisite: BAd 225/U&RP 259 and BAd 226; must be taken concurrently with BAd 227. (Spring)

277–78 **Historic Preservation: Principles and Methods** (3–3) Longstreth
Joint offering of the Urban and Regional Planning Department and the American Studies Program. Same as Hist 277–78. Exploration of scope and purpose of the preservation movement in the United States with focus on developments from the 1960s to the present. Topics include the emergence of preservation theories in the 19th century, relationships between attitudes toward the past and toward design, the intent and impact of legislation, organizational dynamics, approaches to documentation, the concept of significance, and preservation as an instrument of change. Discussions with representatives of organizations and public agencies supplement class lectures. (Academic year)

290 **Special Topics in Urban and Regional Planning** (3) Staff
Experimental offering, new course topics and teaching methods. May be repeated once for credit. (Fall or spring)

295 **Research Methods** (3) Staff
Directed research and investigation of special problems in community development. May be repeated once for credit. (Fall and spring)

298 **Directed Readings and Research in Urban and Regional Planning** (3) Staff

300 **Thesis Research** (3) Staff
(Fall and spring)

**Fourth Group**

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. They are open to selected master's students upon petition approved by the Associate Dean.

311–12 **Seminar: Public–Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society. Prerequisite: doctoral degree candidacy status.

398 **Advanced Reading and Research** (arr.) Staff
Limited to doctoral candidates preparing for the general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to doctoral candidates. May be repeated for credit. (Fall and spring)

## WOMEN'S STUDIES—GRADUATE PROGRAMS

*Assistant Professor* P.M. Palmer *(Director)*
*Adjunct Assistant Professor* R. Spalter-Roth
*Assistant Professorial Lecturer* M.B. Pratt

**Committee on Women's Studies**
T. Brennan, M.M. Cassidy, B.L. Catron, K. Hamel, J.O. Horton, P.H.M. Lengermann, P.M. Palmer, S. Ridder, A. Romines, R. Spalter-Roth, S.L. Wolchik

The Graduate School of Arts and Sciences offers two interdisciplinary programs leading to the degrees of Master of Arts in the field of women's studies and Master of Arts in the field of public policy with a concentration in women's studies. Both are directed by the Committee on Women's Studies and draw upon faculty from various departments within the University and resource persons in the community.

The women's studies programs seek to examine and integrate the contributions of established academic disciplines to an understanding of the historical and contemporary role and status of women, and to provide training necessary to evaluate and formulate equitable public policy for women. Each student will work closely with an advisor in designing a program to meet individual research interests and professional goals. Prospective degree candidates should consult with the director of the Women's Studies Program.

*Master of Arts in the field of women's studies* and *Master of Arts in the field of public policy with a concentration in women's studies*—Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Required: the general requirements stated under the Graduate School of Arts and Sciences, and 36 semester hours of course work, with or without a thesis. All students must take a common core of women's studies courses: WStu 220, 221, 225, and a final 6 hours of either WStu 283 and 295 or WStu 299–300. Policy-oriented students must take four of the six courses in the public policy core (Stat 104, 183; PSc 203; Psyc 244; Econ 211, 217, 247), with Stat 104, 183, PSc 203, Psyc 244, and Econ 217 recommended; WStu 240 may be substituted for the core policy analysis course (PSc 203). Of the remaining three courses, two must be in the same discipline, which may be in the humanities, social sciences, or public administration. Those pursuing the Master of Arts in the field of women's studies must take, in addition to the core courses in women's studies, 12 semester hours in one other discipline (history, literature, economics, philosophy, or sociology) and 9 hours of electives. With permission, other disciplinary concentrations may be selected. All candidates are required to pass a Master's Comprehensive Examination.

220 **Perspectives on Women** (3) Palmer
Survey of the historical development of feminist theory in Europe and the United States from the 1790s to the 1930s, focusing especially on feminist responses to and critiques of basic assumptions of the developing social science disciplines. Topical focus on the application of theories to the explanation of sexuality, family, work, and political roles of women. (Fall)

221 **Research Issues in Women's Studies** (3) Spalter-Roth
Analysis of the contribution of feminist or gender-relations perspectives from humanities and social science disciplines to the issues and methods of social research and social policy and practice. Topics include a review of feminist frameworks, a critique and re-evaluation of traditional academic disciplines

and analysis of current research on and for women, especially in the areas of race, sexuality, work, poverty, and social change. (Fall)

225 **Feminist Theory** (3) Staff
Theoretical foundations of feminism in the United States. Theories and proposals for change currently espoused. Although focus is primarily on contemporary American feminism, some Third World and European thought will be considered. (Spring)

240 **Women and Public Policy** (3) Staff
Gender analysis of U.S. government policies, such as equal employment opportunity, Social Security, and the federal budget. Basic steps in systematic policy analysis and how such analyses are affected by questions of gender distribution of power and money. (Spring)

241 **Women and the Law** (3) Ridder
Legal status of women. Emphasis on marital status, employment, media, education, health services, crime, and the Constitution. (Spring)

251 **Women, Literature, and the Arts** (3) Romines
Woman as subject and object. Examination of stereotypes, themes, language, patterns, and symbolism in works by and about women. Particular attention to the woman as artist and the development of feminist criticism. (Fall)

260 **Women in the American Work Force** (3) Palmer
Joint offering of the American Studies Program and the Women's Studies Program. Multidisciplinary analysis of women's role in the labor force and gender-based division of labor. Views of women's work in the home and outside it; interrelationships of women in and out of the work force; class, race, and ethnic differences. (Spring)

270 **Seminar: Selected Topics** (3) Pratt
Investigation of a current policy issue of particular concern to women, or consideration of women's status in a particular social system. (Fall and spring)

280 **Independent Study** (3) Staff
May be repeated for credit. Arrangements must be made with sponsoring faculty member prior to registration.

283–84 **Practicum in Women's Studies** (3) Staff
Study of the changing status of women through supervised assignment to public and private agencies engaged in policy-making, education, political action, and research. Placement arrangements begin the semester prior to registration for this course.

295 **Independent Research in Women's Studies** (arr.) Staff
Individual library or field research. Program advisor's approval of a written proposal required.

299–300 **Thesis Research** (3–3) Staff

The courses listed below, which emphasize the experience of women in the past and present, are available in Columbian College for undergraduate and graduate students:

AmCv/Hist 185 *History of Women in America*
Class 170 *Women in Classical Antiquity*
Econ 141 *Women in the Labor Market*
Hist 125 *Women in European History*
Psyc 150 *Psychology of Sex Differences*
Rel 181 *Women in Western Religion*
Soc 155 *Gender Roles and Socialization*

## YIDDISH

See **Classics.**

## ZOOLOGY

See **Biological Sciences.**

## FACULTY AND STAFF OF INSTRUCTION 1987–1988

**Columbian College of Arts and Sciences**

**Graduate School of Arts and Sciences**

**School of Education and Human Development**

**School of Government and Business Administration**

**School of International Affairs**

### EMERITI

Caroline Lander Adams, *Professor Emeritus of Botany*
B.A. 1925, Illinois College; M.S. 1928, University of Chicago; Ph.D. 1932, University of Wisconsin

Grover LaMarr Angel, *Professor Emeritus of Education*
B.A. 1929, High Point College; M.A. in Ed. 1946, Ed.D. 1952, George Washington University

Robert Edward Baker, *Professor Emeritus of Education*
B.S. in Ed. 1939, State University of New York at Buffalo; M.A. 1954, Catholic University of America; M.A. in Ed. 1956, Ed.D. 1962, George Washington University

Gretchen Rogers Bolwell, *Professor Emeritus of German*
B.A. 1930, M.A. 1931, George Washington University; Ph.D. 1938, Johns Hopkins University

Perry Botwin, *Professor Emeritus of Special Education*
B.S. 1942, Rutgers—The State University; M.A. 1947, New York University; Ed.D. 1957, Columbia University

Marcella Brenner, *Professor Emeritus of Education*
B.S. in Ed. 1934, Johns Hopkins University; M.A. 1949, American University; Ed.D. 1962, George Washington University

Harold Frederick Bright, *Professor Emeritus of Statistics; Vice President for Academic Affairs Emeritus*
B.A. 1937, Lake Forest College; M.S. 1944, University of Rochester; Ph.D. 1952, University of Texas

David Springer Brown, *Professor Emeritus of Management*
B.A. 1936, University of Maine at Orono; Ph.D. 1955, Syracuse University

Elizabeth Burtner, *Professor Emeritus of Physical Education*
B.A. 1927, Hood College; M.A. 1935, Columbia University

Willard Edmund Caldwell, *Professor Emeritus of Psychology*
B.A. 1940, M.A. 1941, University of Florida; Ph.D. 1946, Cornell University

Wesley Thomas Carroll, *Professor Emeritus of Education*
B.S. 1933, Iowa State University of Science and Technology; M.A. 1940, Ph.D. 1952, University of Nebraska

James Harold Coberly, *Professor Emeritus of English*
B.A. 1933, M.A. 1938, Ph.D. 1949, George Washington University

Charles William Cole, *Professor Emeritus of English*
B.A. 1930, M.A. 1931, Ph.D. 1939, George Washington University

Mary Ellen Coleman, *Professor Emeritus of Education*
B.S. 1937, Madison College; M.A. in Ed. 1950, George Washington University

Roderic Hollett Davison, *Professor Emeritus of European History*
B.A. 1937, Princeton University; M.A. 1938, Ph.D. 1942, Harvard University

William Rankin Duryee, *Research Professor Emeritus of Pathology (Experimental)*
B.A. 1927, Ph.D. 1933, Yale University

Julian Eisenstein, *Professor Emeritus of Physics*
B.S. 1941, M.A. 1942, Ph.D. 1948, Harvard University

**Lloyd Hartman Elliott, *Professor Emeritus of Higher Education***
B.A. 1937, Glenville State College; M.A. 1939, LL.D. 1967, West Virginia University; Ed.D. 1948, University of Colorado; LL.D. 1963, University of New Hampshire; LL.D. 1965, Colby College; LL.D. 1966, Concord College; LL.D. 1969, University of Maine at Orono; LL.D. 1970, Husson College; LL.D. 1971, Georgetown University; Litt.D. 1986, West Virginia Institute of Technology; D.H.C. 1986, Kansai University, Japan; LL.D. 1988, American University

**Richard Ferdinand Ericson, *Professor Emeritus of Management***
B.A. 1943, M.B.A. 1948, University of Chicago; Ph.D. 1952, Indiana University

**Andrew Gyorgy, *Professor Emeritus of International Affairs and Political Science***
B.A. 1937, J.D. 1938, University of Budapest; M.A. 1939, University of California, Berkeley; Ph.D. 1943, University of California, Los Angeles

**Ira Bowers Hansen, *Professor Emeritus of Zoology***
B.S. 1928, M.A. 1929, Wesleyan University; Ph.D. 1932, University of Chicago

**Clarence Richard Hartman, *Associate Professor Emeritus of Microbiology***
B.A. 1933, M.D. 1936, George Washington University

**Roy Hertz, *Research Professor Emeritus of Pharmacology***
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hopkins University

**Henry William Herzog, *Vice President and Treasurer Emeritus***
B.S. in C.E. 1930, LL.D. 1978, George Washington University

**Ching-Yao Hsieh, *Professor Emeritus of Economics***
B.A. 1939, St. John's University, China; M.A. 1958, Ph.D. 1964, George Washington University

**Thelma Hunt, *Professor Emeritus of Psychology***
B.A. 1924, M.A. 1925, Ph.D. 1927, M.D. 1935, George Washington University

**Joe Lee Jessup, *Professor Emeritus of Business Administration***
B.S. in B.A. 1936, University of Alabama; M.B.A. 1941, Harvard University; LL.D. 1964, University of Chungang, Korea

**Eva Mayne Johnson, *Professor Emeritus of Psychology***
B.A. 1949, M.A. 1951, Ph.D. 1957, George Washington University

**Samuel Kavruck, *Professor Emeritus of Education***
B.S. 1937, M.S. in Ed. 1939, City University of New York, City College; M.A. in Govt. 1950, Ed.D. 1954, George Washington University

**Virginia Randolph Kirkbride, *Professor Emeritus of Educational Psychology***
B.A. 1941, M.A. 1942, University of Nebraska; Ed.D. 1959, George Washington University

**Solomon Kullback, *Professor Emeritus of Statistics***
B.S. 1927, City University of New York, City College; M.A. 1929, Columbia University; Ph.D. 1934, George Washington University

**John Francis Latimer, *Professor Emeritus of Classics***
B.A. 1922, D.Litt. 1964, Mississippi College; M.A. 1926, University of Chicago; Ph.D. 1929, Yale University; D.H.L. 1987, George Washington University

**Thelma Z. Lavine, *Elton Professor Emeritus of Philosophy***
B.A. 1936, Radcliffe College; M.A. 1937, Ph.D. 1939, Harvard University

**Sar Levitan, *Professor Emeritus of Economics***
B.S.S. 1937, City University of New York, City College; M.A. 1939, Ph.D. 1949, Columbia University

**Ralph Kepler Lewis, *Professor Emeritus of Anthropology***
B.A. 1934, Southwest Missouri State College; M.A. 1939, University of Southern California; Ph.D. 1967, Columbia University

**Calvin Darlington Linton, *Professor Emeritus of English; Dean Emeritus of Columbian College of Arts and Sciences***
B.A. 1935, George Washington University; M.A. 1939, Ph.D. 1940, Johns Hopkins University

**William Allan MacDonald, *Professor Emeritus of Art and Archaeology***
B.A. 1940, Oberlin College; M.A. 1942, Ph.D. 1943, Johns Hopkins University

**Eugene Ross Magruder, *Associate Professor Emeritus of Business Administration***
B.B.A. 1950, M.B.A. 1951, University of Texas; Ph.D. 1959, Ohio State University

**Anthony Marinaccio, *Professor Emeritus of Education***
Ed.B. 1937, Central Connecticut State College; M.A. 1939, Ohio State University; Ph.D. 1949, Yale University; LL.D. 1961, Parsons College

**Muriel Hope McClanahan, *Associate Professor Emeritus of English***
B.A. 1935, Colorado College; M.A. 1937, Ph.D. 1940, University of Pittsburgh

**Margaret McIntyre, *Professor Emeritus of Education***
B.S. in Ed. 1939, State University of New York at Buffalo, M.A. 1944, Northwestern University; A.P.C. 1963, George Washington University

**Florence Marie Mears, *Professor Emeritus of Mathematics***
B.A. 1917, Goucher College; M.A. 1924, Ph.D. 1927, Cornell University

**Howard Maxwell Merriman, *Professor Emeritus of American Diplomatic History***
B.A. 1930, M.A. 1931, University of Cincinnati; M.A. 1932, Ph.D. 1937, Harvard University

**Franz Henry Michael, *Professor Emeritus of International Affairs and Far Eastern History***
Sinological Diploma 1930, University of Berlin; Referendar 1931, Dr.Jur. 1933, University of Freiburg

**Frank Nelson Miller, Jr., *Professor Emeritus of Pathology***
B.S. 1943, M.D. 1948, George Washington University

**Edith Elizabeth Mortensen, *Professor Emeritus of Zoology***
B.A. 1925, Carleton College; M.A. 1927, University of Minnesota; Ph.D. 1945, George Washington University

**Charles Rudolph Naeser, *Professor Emeritus of Chemistry***
B.S. 1931, University of Wisconsin; M.S. 1933, Ph.D. 1935, University of Illinois

**David Nelson, *Professor Emeritus of Mathematics***
B.A. 1939, M.A. 1940, Ph.D. 1946, University of Wisconsin

**Harry Robert Page, *Professor Emeritus of Business Administration***
B.A. 1941, Michigan State University; M.B.A. 1950, Harvard University; Ph.D. 1966, American University

**Kittie Fenley Parker, *Professor Emeritus of Botany***
B.A. 1930, M.A. 1932, University of California, Berkeley; Ph.D. 1946, University of Arizona

**Thomas Martin Peery, *Professor Emeritus of Pathology***
B.A. 1928, D.M.S. 1966, Newberry College; M.D. 1932, Medical University of South Carolina

**Ruth Irene Peterson, *Professor Emeritus of Education***
B.S. 1945, State University of New York at Buffalo, M.S. 1946, Syracuse University; Ph.D. 1971, American University

**Vladimir Petrov, *Professor Emeritus of International Affairs***
M.A. 1961, Ph.D. 1965, Yale University

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SCHOOL OF MEDICINE AND HEALTH SCIENCES

# BULLETIN

THE GEORGE WASHINGTON UNIVERSITY

1988-1989

The George Washington University
School of Medicine and Health Sciences Bulletin
September 1988

Published by the University at Washington, D.C. 20052

# School of Medicine and Health Sciences Bulletin 1988–1989



The George Washington University
Washington, D.C.



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# The University

## *History and Organization*

The George Washington University had its beginning in 1821 as the Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to the George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice and theory of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of the Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter, which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character, it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and one-half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half-century, the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. Within a few blocks are the White House, the Department of the Interior, the State Department, the World Bank, and many other governmental offices and international agencies. The area has many reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 I Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and

I Streets, and Washington selected Twenty-third and E Streets as the site of the National University he had hoped to see established.

The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the Schools of Medicine and Health Sciences, Engineering and Applied Science, Education and Human Development, Government and Business Administration, and International Affairs; and the Division of Continuing Education.

## *Academic Status*

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Schools. The University is on the approved list of the American Association of University Women and is a member of the College Board. The Department of Chemistry is on the approved list of the American Chemical Society.

The School of Medicine and Health Sciences has had continuous approval by its accrediting body, which is currently the Liaison Committee on Medical Education, sponsored jointly by the American Medical Association and the Association of American Medical Colleges. The Doctor of Medicine degree of the School of Medicine and Health Sciences is recognized by all state and territorial medical licensure boards in the United States.

## *University Policy on Equal Opportunity*

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to educational programs and employment. The University is also subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Dr. Marianne Phelps, Associate Provost, George Washington University, Rice Hall, Washington, D.C. 20052, (202/994-6508, or to the Assistant Secretary for Civil Rights of the Department of Education.

## Board of Trustees of the University

The University is privately endowed and is governed by a Board of Trustees of which the president is an *ex officio* member.

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# The School of Medicine and Health Sciences

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The Vice President and Executive Dean is the chief executive officer of the Medical Center, with overall responsibility for all programs of the Center. As chief executive officer, the Vice President is also the recipient of the Walter A. Bloedorn Professorship of Administrative Medicine, established by the Walter A. Bloedorn Foundation in memory of the late Dean of the Medical Center.

### *Office of Academic Affairs*

The Office of Academic Affairs bears the responsibility for the curriculum; student affairs, including scholarship and financial aid; research and sponsored programs; health sciences programs; educational evaluation; admissions; and support services of the library and audiovisual and animal facilities.

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### *Office of Administrative Affairs*

The Office of Administrative Affairs is responsible for the administration of the University Hospital and the Medical Faculty Associates, for support services to the School of Medicine and Health Sciences, and for the financial management of the Medical Center.

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### *Office of Clinical Affairs*

The Office of Clinical Affairs is responsible for the patient care activities of the University Hospital and the Medical Faculty Associates and for the supervision of the graduate and continuing medical education programs and community affiliation programs.

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## History

The School of Medicine and Health Sciences of the George Washington University has a distinguished history that goes back more than a century and a half. In March 1825 the School opened with the intention of building "a medical school commensurate with the progress and demands of a rising metropolis, and the improvement of service throughout the country." The School, the eleventh oldest medical school in the country, has met this responsibility by providing its students with a foundation in the medical sciences on which they have built careers in practice, teaching, research, or administration.

In 1844 the School took on a new dimension when Congress granted it the use of the Washington Infirmary. Thus, one of the earliest general teaching hospitals in the nation was established in Washington.

The distinguished history of the George Washington University School of Medicine and Health Sciences closely parallels the academic advances and medical progress of the nation. The School has contributed to both.

The George Washington University Medical Center, established in 1966, consists of Walter G. Ross Hall, which houses the School of Medicine and Health Sciences; the Paul Himmelfarb Health Sciences Library; the University Hospital; the H.B. Burns Memorial Building, which houses the Medical Faculty Associates; the Helen L. and Mary E. Warwick Memorial Building; and affiliated hospitals.

In 1973, with the introduction of undergraduate programs in allied health sciences, the name of the School was officially changed from the School of Medicine to the School of Medicine and Health Sciences.

## Regulations

Students enrolled in the University are required to conform to the following regulations and to comply with the rules and regulations of the college, school, or division in which they are registered.

Students who withdraw or are suspended, or who, for any other reason, are not registered at the University for one semester or more, may reenter and continue work only under the regulations and requirements in force at the time of return.

If students knowingly make false statements or conceal material information on applications for admission, registration forms, or any other University documents, students' registrations may be canceled. If such falsification is discovered after students have matriculated at the University, students may be subject to dismissal from the University. Such students will be ineligible (except by special action of the faculty) for subsequent registration in the University.

### *Registration*

Attendance in class requires compliance with the School's registration deadlines.

### University Policy on the Release of Student Information

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions that are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive students' written consent before releasing information from their education records to persons outside the University, except for directory information as indicated below (information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency); and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height, weight, and age of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar at the beginning of each semester or session of enrollment.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

### Right to Dismiss Students

The right is reserved by the University to dismiss or exclude any student from the University or from any class or classes whenever, in the interest of the student or the University, the University administration deems it advisable.

### Right to Change Rules

The University and its college, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

### Right to Make Changes in Programs

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

### University Policy on Drugs

The University cannot condone violations of law, including violation of those laws that proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken to protect the interests of the University and the rights of others.

### *The Libraries*

Students have the privilege of using the University's Gelman Library and the Paul Himmelfarb Health Sciences Library. The stacks are open, and all students are welcome to browse at their leisure. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

All students using the libraries are expected to be familiar with the regulations governing their use, which are available at each library.

### *Property Responsibility*

The University is not responsible for the loss of personal property. A Lost and Found Office is maintained on campus in the Safety and Security Office.

## Fees and Financial Regulations

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution makes up the difference.

The following fees and financial regulations were adopted for the 1988 summer sessions and the academic year 1988–89.

**Tuition Fees**

| | |
|---|---|
| For M.D. candidates, for the academic year | $21,900* |
| For M.P.H. candidates: | |
| Fall and spring semesters, each semester hour, to a maximum of $4,785 per semester | 358 |
| Summer sessions, each semester hour | 291 |
| For students in undergraduate health sciences programs | † |

**Marvin Center Fee** (charged all students registered on campus)
Each semester hour, to a maximum of $100.50 per semester ..... 9.50

**Additional Course Fees**—In certain courses additional fees, such as laboratory and material fees, are charged by semester as indicated in the course descriptions. If breakage of apparatus is in excess of the normal amount provided for in the laboratory fee, the student will be required to pay such additional charges as are determined by the department concerned.

**Computer Usage Fees** (charged for courses that use the computer facilities of the University)—Applicable fees are listed in the *Schedule of Classes* for each semester. The maximum computer usage fee is $100 for any semester.

**Cost of Textbooks and Equipment for M.D. Candidates**—The minimum cost of textbooks and equipment (such as a microscope, drawing materials, glass slides, clinical thermometer, stethoscope, hemocytometer, and uniforms) is approximately as follows: first year, $900; second year, $700; third year, $400; and fourth year, $400. Micros. per must be provided by the student; rentals are not available from the School.

*M.D. candidates who take courses offered by other divisions of the University during the summer sessions pay the summer sessions rate of $291 per semester hour.
†Tuition fees for undergraduate health sciences students vary by program and location. Please check with the Office of Health Sciences Programs Administration for specific rates.

**Special Fees and Deposits**

| | |
|---|---|
| Application fee (M.D. candidate), nonrefundable | $40.00 |
| Application fee (M.P.H. candidate), nonrefundable | 30.00 |
| Application fee (undergraduate degree or certificate candidate), nonrefundable | 30.00 |
| Advance tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student | 100.00 |
| Admission tests (when required) | 15.00 |
| Late-registration fee, for failure to register within the designated period: | |
| During first week of classes | 25.00 |
| During second and third weeks of classes | 50.00 |
| After third week of classes (if permitted) | 100.00 |
| Late-payment fee (see Payment of Fees, below) | 15.00 |
| Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below) | 35.00 |
| Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason | 15.00 |
| Special Columbian College of Arts and Sciences departmental examination to qualify for receiving credit (advanced standing), waiver of requirement, or both | 50.00 |
| Waiver examination to qualify for advanced placement | 20 00 |
| English test for international students (when required) | 15.00 |
| Laboratory check-out fee, for failure to check out of chemistry laboratory by the deadline date set by the instructor (a student who drops a chemistry course before the end of the semester must check out of the laboratory at the next laboratory period) | 10.00 |
| Transcript fee | 2.00 |
| Replacement of lost or stolen picture identification card | 2.00 |

Registration for on-campus courses in the University entitles each student to the following University privileges: (1) the use of the University libraries; (2) the services of the Career Services Center; (3) gymnasium privileges; (4) admission to all athletic contests, unless otherwise specified; (5) the *Hatchet*, the student newspaper; (6) medical attention as described under Student Health Service. These privileges terminate when the student withdraws or is dismissed from the University.

## Payment of Fees

***M.D. Program.*** The annual tuition fee for the M.D. program is payable in two equal installments on or before registration day for each semester. M.D. students who register during the summer for courses offered in other divisions of the University are charged the regular summer tuition and other fees.

***Physician Assistant Program.*** The annual tuition for the nurse practitioner and physician assistant programs is payable in three equal installments on or before registration for each semester. The summer sessions portion of the program is considered a regular semester.

***All Other Programs.*** Except for those programs listed above, tuition and fees will be assessed each semester on the basis of the program of studies for which the student registers.

***Payment Policies.*** No student is permitted to complete registration or attend classes until all charges are paid or until arrangements for payment have been made. Tuition and fees for each semester, as described above, are due and payable in full at the Office of the Cashier at the time of each registration. Checks should be made payable to George Washington University, with the student identification number in the upper left corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Interest at the rate of 8 percent per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $2,000 or more. Under such circumstances the student may be permitted to pay one-half of the amount due at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of 8 percent per annum. Accounts that become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled. In addition, applications for institutional and federal financial aid cannot be processed until all encumbrances, including those for unpaid emergency loans, have been paid. Financial settlement will require payment in full of all amounts due to the University in addition to a financial reinstatement fee of $35. Accounts that must be referred to a collection service will be assessed all collection costs, including fees charged by the collection agency.

Students auditing courses are subject to all fees charged to students registered for credit.

Acceptance by the University of a student's fees does not in any way obligate the School of Medicine and Health Sciences to accept the student for any subsequent semester or summer session, and the right is reserved to require the withdrawal of any student whenever, in the interest of the student or the School, the Executive Committee of the Medical Center deems it advisable to do so.

***Returned Check Policy.*** A student whose check is returned unpaid by the bank for any reason will be charged a returned check fee. If the check is not paid within 15 days, the student's account will be financially encumbered with the same restrictions and penalties as for late payment enumerated above.

***One-Year Prepaid Tuition Plan.*** Undergraduate students paying the set upper limit of tuition may receive a discount for the spring semester if payment is made for the full academic year at the time of fall registration. At the 1988–89 rate, students choosing this plan would pay $9,474 for two semesters instead of $9,570.

***GWU Monthly Payment Plan.*** The University's Monthly Payment Plan is available to all students. Upon receipt of the appropriate application, the University will establish an account and mail payment coupons and envelopes for use to ensure proper credit of payments. The plan covers an academic year (excluding summer sessions) and requires ten monthly payments. May

through February. Payments must be received by the 10th of each month. If a decision is made after May to use this plan, all missed payments must be made to bring the account current to the time participation is initiated. There is no charge and no interest for using the plan if all payments are made as scheduled.

***Commercial Prepaid and Deferred Payment Plans.*** Several commercial programs for parents who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

Mellon Bank Edu-Check Plan, P.O. Box 8888, Wilmington, Del. 19899
Knight Insured Tuition Payment Plans, 53 Beacon Street, Boston, Mass. 02108
School-Chex, Irving Trust Company, 61 Broadway, New York, N.Y. 10007
Educational Loan Program, Consumer Credit Department, Riggs National Bank, 1120 Vermont Ave., N.W., Washington, D.C. 20005
The Tuition Plan, Inc., Concord, N.H. 03301
Tuition Line, Maryland National Bank, Consumer Banking Division, P.O. Box 1954, Baltimore, Md. 21203

## Withdrawals and Refunds

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the dean. Notification to an instructor is not an acceptable notice. Financial aid recipients must notify the Office of Student Financial Aid in writing.

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters. No refund of the $100 tuition deposit required of entering undergraduate students is granted.

1. *Complete withdrawal from all courses*:
   Withdrawal dated on or before Friday of the first week of classes..... 90%
   Withdrawal dated on or before Friday of the third week of classes..... 75%
   Withdrawal dated on or before Friday of the fifth week of classes..... 50%
   Withdrawal dated after the fifth week of classes..... None
2. *Partial withdrawal*: If the change in program results in a lower tuition charge, the refund schedule above applies to the difference.
3. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

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Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education. Federal regulations require that financial aid recipients use such refunds to repay financial aid received for that semester's attendance. This policy applies to institutional aid as well.

In no case will tuition be reduced or refunded because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

## Student Life

The Office of the Vice President for Student Affairs develops student life services, policies, and procedures to complement the University's formal instruction program. These activities are implemented through the offices of the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educational Opportunity Program, Housing and Residence Life, International Student Services, Student Activities, Career Services Center, Student Health Service, and Disabled Student Services. More detailed information on these and other activities is contained in the *Student Handbook*.

### *Student Health Service*

The Student Health Service is an outpatient clinic staffed by physicians, nurse practitioners, and physician assistants who are capable of addressing most of students' medical problems. Visits are cost-free and may be either arranged by appointment or, during certain hours, secured on a walk-in basis. Many routine laboratory tests may be performed in the Health Service lab at cost. Allergy shots, immunizations, and various lab tests are done at little or no charge. Psychiatric evaluation, crisis intervention, and short-term therapy are available by appointment.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the emergency room of the University Hospital for treatment. All fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in off-campus programs and the Continuing Engineering Education Program are not eligible. The bills incurred from all services rendered outside the Student Health Service (for example, X-ray work, laboratory work, and office visits to private physicians) are the responsibility of the student.

***Health and Accident Insurance.*** The University has arranged for and endorsed group health and accident insurance, on an elective basis, for all students. Interested students should consult the Student Health Service or the Office of the Dean of Students.

### *Residence Halls and Food Service*

The University's residence halls and food service are operated on the basis of the regular academic year (late August through early May). They are, therefore, not a useful option for most students in the School of Medicine and Health Sciences. Information on residence halls and food service is available from the office of Housing and Residence Life, Rice Hall, fourth floor, 2121 I Street, N.W. This office also maintains listings of private housing available in the metropolitan area.

### *Cloyd Heck Marvin Center*

The Cloyd Heck Marvin Center is the campus community center, offering services and recreational and social opportunities for students, faculty, staff, alumni, and campus guests. It also provides the setting for a variety of programs conducted by the University Program Board, the academic departments, and student and faculty organizations.

The Marvin Center Governing Board, representative of all segments of the University community, plays an important role in the functioning of the center.

by working closely with the center's staff in the review and development of the procedures and policies that direct the operation of the center.

## Facilities

### *Walter G. Ross Hall*

Walter G. Ross Hall, opened in 1973, houses the teaching and laboratory facilities for students in the School of Medicine and Health Sciences. It occupies a city block on the northwest edge of the University campus; its total area is approximately 550,000 square feet, or more than 10 acres.

### *Educational Support Services*

A group of core facilities and services supports the educational, clinical, and research programs of the Medical Center. Coordinated by the Associate Dean for Education, these services include the following.

***Office of Audiovisual Education and Services (Frank D. Allan, Ph.D., Director).*** This office provides consultation in the use of nonprint media and arranges for display of audiovisual materials and programs. Its production capabilities are available to students, faculty, and staff and include photography, illustration, a television studio, and photoduplicating services.

***Office of Academic Computer Services (Helmuth F. Orthner, Ph.D., Director).*** This office offers computer assistance in such areas as educational testing, evaluation of student feedback, course registration, continuing medical education credit reporting, conference management, and automation of library procedures and inventories. The office also supports small data bases for research projects that require interactive data maintenance or use forms that can be optically scanned, and it can transmit data to the University's computing center for more sophisticated processing. The office also has facilities for word processing and serves as an interface for computer-assisted educational material from Massachusetts General Hospital and Ohio State University.

The facilities of the office include an on-line optical scanner (NCS 7001), a DEC PDP 11/60 minicomputer using the ANSI STANDARD MUMPS language environment, an on-line RJE 3780 communications link to the IBM 4341 in the University Center for Academic and Administrative Computing, a Gandalf communications facility to connect terminals from various locations of the School via dedicated lines using high-speed modems, and several dial-up ports for the switched telephone network.

***Office of Education (Rhonda M. Goldberg, M.A., Director).*** The Office of Education works with faculty and students to improve the educational environment. It conducts evaluations of courses and curricula and works toward the establishment of effective systems for evaluating student performance.

***Paul Himmelfarb Health Sciences Library (Shelley Bader, M.L.S., Director).*** The library's collection includes more than 120,000 volumes and approximately 1,400 serials. The library also offers computerized on-line services that can access a number of bibliographic and information data bases, including MEDLINE, produced by the National Library of Medicine (NLM). The Himmelfarb Library participates in NLM's Regional Medical Library Program, which facilitates interlibrary borrowing.

### The George Washington University Hospital

The George Washington University Hospital, adjacent to the School of Medicine and Health Sciences, is an acute-care facility with 511 adult and 39 pediatric beds. The hospital serves as the primary teaching site for students in the School of Medicine and Health Sciences and for more than 400 physicians participating in the 19 accredited postgraduate training programs offered by the Medical Center. The hospital records approximately 20,000 patient admissions each year and provides a broad range of tertiary care services to an equally broad-based patient population.

The Medical Faculty Associates (MFA) is a private group practice of 200 full-time physicians who practice exclusively at the hospital and are dedicated to its mission of education and quality patient care. The MFA physicians make up the full-time clinical faculty of the Medical Center and represent all medical specialties, including the hospital-based specialties of radiology, pathology, anesthesiology, and emergency medicine. The MFA physicians receive approximately 141,000 patient office visits annually. The emergency medicine group staffs the hospital emergency unit—one of the busiest in the city—and contributes another 48,000 visits per year. The MFA physicians' offices are consolidated in the 13-story H.B. Burns Memorial Building adjacent to the University Hospital.

The George Washington University Health Plan (GWUHP), a health maintenance organization, opened in 1972 to provide patient care and to provide students and house staff with educational experience in a prepaid health plan setting. The GWUHP has more than 20,000 subscribers.

### The Helen L. and Mary E. Warwick Memorial Building

This building houses a computerized multitest facility that is available to physicians for patient evaluation, the intensive care unit research project, and the radiation safety office.

### Affiliated Hospitals

***Children's Hospital National Medical Center.*** Children's Hospital is the site for the School's Department of Child Health and Development and offers a comprehensive clerkship experience for third-year students and a variety of elective opportunities in the fourth year. The hospital provides primary and tertiary care to children in the greater Washington area and is a referral center for children throughout the world.

***Fairfax Hospital.*** This 656-bed voluntary community teaching hospital, part of a four-hospital system, serves a burgeoning suburban area and provides all clinical services, including psychiatry. Fairfax Hospital offers a rotating internship program, a school of medical technology, and clinical facilities for a school of practical nursing. Students of the School of Medicine and Health Sciences serve at this hospital in clinical clerkship and elective programs. Fairfax Hospital is an affiliated hospital for residency training in obstetrics and gynecology in the George Washington University Medical Center Program.

***Holy Cross Hospital.*** Holy Cross, a 450-bed hospital, is a primary clinical campus that provides students with firsthand exposure to the practice of medicine in the community. It is a private, voluntary facility that provides a full range of medical, surgical, and pediatric services for a growing suburban

population. The hospital has consistently had one of the highest occupancy rates in the metropolitan area.

***National Naval Medical Center.*** The National Naval Medical Center, Bethesda, Maryland, is a 500-bed general hospital that offers a wide range of specialized services, clinical research, and educational programs. Medical care is provided to active-duty and retired military personnel and their dependents. It is a major referral center for thoracic and cardiovascular surgery as well as for cancer therapy. The teaching staff directs internship, residency, and fellowship programs in 25 specialties.

***Saint Elizabeths Hospital.*** Saint Elizabeths Hospital, formerly a federal psychiatric facility established by an 1852 Act of Congress, is now operated by the District of Columbia. Medical students at George Washington University use the facilities of Saint Elizabeths for part of their clinical psychiatric training. A continuing research program is conducted at the hospital under a cooperative arrangement with the National Institute of Mental Health. The hospital maintains an up-to-date health sciences library.

***Veterans Administration Medical Center.*** This 708-bed medical center has medicine, surgery, neurology, and psychiatry bed services. Other clinical services include radiology, nuclear medicine, laboratory (pathology), rehabilitation medicine, and radiation therapy. A 120-bed nursing home has recently been opened. At any time, 140 residents and nearly 100 medical students are receiving training at the VAMC under the supervision of 120 full-time staff physicians and a number of part-time staff physicians, consultants, and attending physicians. Specialized-care programs include drug and alcohol rehabilitation, open-heart surgery, radiation therapy, and an extensive dialysis program.

***Washington Hospital Center.*** This 821-bed private, not-for-profit institution serves the greater Washington area through patient care, teaching, and research. A 74-bed intensive care tower supports the trauma and medical services, the cardiology and open-heart surgery programs, and the area's only adult burn service. The center offers approved postgraduate programs in all specialties except psychiatry and pediatrics for 205 residents and fellows. In addition, clinical rotations or teaching programs are provided for nurses, medical technologists, X-ray technicians, and other allied health professionals.

## Committees 1987–88

***Academic Freedom and Ethics***—G. Simon *(Chair)*
***Admissions and Advanced Standing***—F. Abramson *(Chair)*
***Allied Health Programs***—R. Rosenthal *(Chair)*
***Appointments, Promotions, and Tenure***—V. Cohn *(Chair)*
***Bylaws***—E. Albert *(Chair)*
***Communications and Educational Resources***—L. Affronti *(Chair)*
***Continuing Medical Education***—A. Wasserman *(Chair)*
***Educational Evaluation***—J. Egan *(Chair)*
***Educational Planning***—G. Oliver *(Chair)*
***Graduate Medical Education***—G. Molinari *(Chair)*
***Public Relations***—A. Kwart *(Chair)*
***Student Affairs***—A. Stone *(Chair)*
***Research***—D. Wilkinson *(Chair)*

## Alumni Associations

### *General Alumni Association*

The objectives of this association are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes and to promote the general welfare of the University.

Membership in the association is conveyed automatically to anyone who has been graduated from any school or division of the University. Anyone who has earned 15 credit hours or the equivalent at the University, who has left the University in good standing, and whose class has graduated is eligible for membership.

A Governing Board, composed of members representing the constituent alumni of the University's schools and colleges, directs the activities of the association. The voluntary leadership of the association works closely with the staff of the Alumni Relations Office in carrying out association affairs. The association may be contacted through the Alumni Relations Office.

### *Medical Alumni Association*

The George Washington University Medical Alumni Association, incorporated in 1959, continues the organization previously known as the George Washington University Medical Society. The purposes of the association are to provide constructive services for the M.D. degree alumni of the School of Medicine and Health Sciences and to promote the welfare of the School, its students, the George Washington University Hospital, and its trainees.

The membership of the association consists of all M.D. degree graduates of the School; current members and, on application, past members of the teaching staff of the School who hold doctoral degrees; and doctors of medicine who have had one or more years of postgraduate training in the George Washington University Hospital. Junior membership is granted to all students in the M.D. degree program.

The Medical Alumni Association maintains an office in the School of Medicine and Health Sciences.

The following alumni served on the association council for 1987–88:

Stephen Pappas, M.D. 1956, *President*
Wayne D. Blackmon, M.D. 1978
William H. Cooper, M.D. 1949
Marvin Footer, M.D. 1942
Jack Kleh, M.D. 1944
Ronald Kurstin, M.D. 1971
Sidney Levine, M.D. 1941
Allen Mondzak, M.D. 1961
David R. Notes, M.D. 1966
Alvin Parrish, M.D. 1945
Julius S. Piver, M.D. 1952
David H. Robb, M.D., 1945
Elijah W. Titus, Jr., M.D. 1952
John Umhau, M.D. 1952
Allan Zellis, M.D. 1941

# The Doctor of Medicine Degree Program

## Admission

The George Washington University School of Medicine and Health Sciences seeks to admit intellectually gifted, empathetic, and mature students who have the capacity to excel in the science and art of medicine. Updated information on admission requirements, the application process, the program and the curriculum is provided in a brochure available from the School's Office of Admissions. Applicants are encouraged to review this document carefully.

### *Admission Requirements*

To be considered for admission to the Doctor of Medicine (M.D.) degree program, applicants must have successfully completed a minimum of 90 semester hours at an accredited U.S. or Canadian institution of higher education. Professional school credit may be applied toward fulfillment of this minimum requirement only if the credit has already been accepted by the applicant's college or university toward a bachelor's degree. (Under the quarter system, a credit is two-thirds of a semester hour.) In most instances, applicants should complete four full years of undergraduate study; only exceptional applicants are accepted upon completion of the minimum requirements.

Exceptional students with three years of undergraduate work in George Washington University's Columbian College may be admitted to this medical school and receive a combined Bachelor of Arts–Doctor of Medicine degree. (see page 25).

An early selection program enables George Washington University undergraduates to apply to the medical school at the end of the sophomore year. Those students accepted create a broad and vigorous program tailored to promote intellectual growth during their last two years in college. After graduation, they may enter the M.D. program. Applications and letters of evaluation are due in mid-May. Contact the Office of Admissions for more detailed information.

The following course work must be completed with satisfactory achievement before the applicant can be certified for matriculation. All required science courses must include sufficient laboratory work to ensure familiarity with the experimental methods and techniques of the disciplines.

*Biology*—eight semester hours, including two semester hours of laboratory, in general biology or zoology, but *not* in botany.

*Chemistry*—eight semester hours of general inorganic chemistry (which may include qualitative analysis), including two semester hours of laboratory, and six to eight semester hours of organic chemistry, including laboratory.

*Physics*—eight semester hours, including at least two semester hours of laboratory.

*English*—six semester hours in composition and literature, which may be the standard introductory college courses or their equivalents.

The number of required courses has been kept to a minimum to enable college students to pursue their own interests in depth. The admissions committee has no preference with regard to the applicant's major area of study. Applicants with majors in the arts, humanities, and social sciences are as admissible as applicants with science majors. The committee does expect, however, that work in the student's chosen area of concentration as well as

the required science courses will reflect scholarly interests and show evidence of significant achievement.

Applicants must submit scores on the Medical College Admission Test (MCAT). MCAT scores will be valid only if the test was taken within three years of the date of expected matriculation.

### Application Procedure

***For Admission to the First-Year Class.*** Application forms are available from the Office of Admissions. All applicants are reminded that the submission of false or misleading information on application forms or in connection with the application process will be grounds for rejection. If such submission is discovered after entrance into the School or award of a degree, it will be grounds for dismissal or for revocation of the degree.

The School participates in the American Medical College Application Service (AMCAS). Applications for a place in the first-year class can be obtained only from AMCAS, 1776 Massachusetts Avenue, N.W., Suite 301, Washington, D.C. 20036. When completed, this application is returned to AMCAS for distribution to schools selected by the applicant. The AMCAS application deadline is November 15 of the year preceding that for which admission is sought.

When it receives the AMCAS application, the Office of Admissions will send the applicant a supplemental application requesting information not included on the AMCAS application. The supplemental application must be returned with the nonrefundable supplemental application fee ($40) no later than December 31. After these materials are reviewed, some applicants will be asked to submit letters of evaluation. The admissions committee will then invite the most promising candidates to come for personal interviews. Applicants will be informed of the committee's final decision as soon after the interviews as possible. Although it does not assume an obligation to report missing or erroneous credentials, the admissions office will try to contact the applicant if it is noted that necessary credentials are missing.

The School also participates in the AMCAS Early Decision Program. Interested applicants should read the AMCAS information booklet included with the AMCAS application materials. Early decision applicants should be aware that (1) they must submit their applications by August 1 of the year preceding that for which admission is sought, and (2) their supplemental applications and all letters of recommendation and transcripts must be received by the Office of Admissions no later than September 1. Decisions on these applications are usually made by October 1 and no later than October 15.

Applicants should refer to the AMCAS information booklet and to the admissions brochure available from the School of Medicine and Health Sciences Office of Admissions for the most up-to-date information available at the time of application. Details included in those sources supersede information contained in this *Bulletin*.

***For Admission With Advanced Standing.*** Information and applications for admission with advanced standing should be obtained from the Office of Admissions (M.D. Program), School of Medicine and Health Sciences, 2300 I Street, N.W., Washington, D.C. 20037.

Applications may be submitted for either the second or third year. Applicants for advanced standing must meet all requirements for admission to the first year of study in the School of Medicine and Health Sciences (see Admission Requirements). All applicants, except those currently enrolled in

Doctor of Medicine degree programs at U.S. or Canadian schools, will be required to record scores on each subtest of the Medical Science Knowledge Profile.

All applicants must submit the advanced standing application and $40 application fee by mid-May, three letters of recommendation, and Medical Science Knowledge Profile or National Board of Medical Examiners scores. If accepted, *official transcripts will be required*. The admissions committee will request an interview with selected students. Detailed information and guidelines may be obtained from the Office of Admissions in January of the intended year of transfer.

### *Selection Procedures*

To process first-year applications fairly and expeditiously, the School uses an evaluation procedure that screens applicants on the basis of undergraduate grades (taking into account improvement in performance in later years), MCAT scores, and pertinent extracurricular and work experience. Some additional consideration is given to applicants from the Washington metropolitan area and to applicants from George Washington University. There are no age limits.

Following this initial screening, approximately 60 percent of all applicants are asked to submit letters of evaluation. The admissions committee then invites about 1,000 applicants for personal interviews.

When all credentials and interview reports are available, the application is reviewed by the admissions committee. Although grades and MCAT scores are considered, the committee relies heavily on the essay portions of the applications, letters of evaluation, and interview reports in assessing those motivational and personal characteristics it feels are important in future physicians.

Applicants who are offered a place in the class are required, within two weeks, to notify the Office of Admissions (M.D. Program), School of Medicine and Health Sciences, in writing, of their intent to accept the place reserved. A substantial deposit is required in July and is credited toward the first semester's tuition.

## Program of Study

The curriculum leading to the Doctor of Medicine prepares students for professional lives of continuous learning. It is presumed that all graduates will seek additional training before assuming complete responsibility for independent clinical decision making.

In the first year, students concentrate primarily on basic sciences, including anatomy and biochemistry in the first semester and physiology, microbiology, and neurobiology in the second.

First- and second-year medical students may, at their discretion, register for electives in addition to the required program of study. The first two weeks of an elective are probationary, so that students may determine whether the elective is suited to their needs. Students may not drop an elective after this probationary period.

The second year integrates clinical information and basic sciences, particularly pathology and pharmacology. Medical students are introduced to physical diagnosis during the first semester of the second year. The course is

study is coordinated by a program director, who works with faculty subcommittees and the second-year subcommittee on educational planning.

During the final two years, the program consists of required clerkships and elective sequences designed to prepare the student for graduate training. Clerkships are required in medicine, surgery, pediatrics, obstetrics and gynecology, psychiatry, health care sciences, anesthesiology, and emergency medicine. Each student must also complete an acting internship in medicine, pediatrics, or family medicine; a nonclinical (didactic) course; and a clinical course in neurosurgery or neurology. In addition, students choose from options in orthopaedics, urology, ophthalmology, pediatric surgery, and otolaryngology.

A variety of elective experiences are available at the University and its affiliated hospitals; permission may be granted to take electives elsewhere.

## Honors

Students will be graduated "with distinction" if they have received no failing or conditional grades during the four-year program leading to the Doctor of Medicine degree and either (1) have received Honors grades in at least 50 percent of the total credit hours earned in required courses during the first three years *or* (2) have received Honors grades in more than 45 percent of the total credit hours earned in required courses during the first three years and have been recommended by a faculty committee on the basis of a strong fourth-year performance.

## Joint Degree Programs

### *Combined Bachelor of Arts and Doctor of Medicine*

To be recommended for the degree of Bachelor of Arts, the candidate must complete at least 90 semester hours of prescribed college work (including a minimum of 30 hours in second-group courses in Columbian College of Arts and Sciences) and the first year of the medical curriculum. Upon satisfactory completion of the fourth year of the medical curriculum the student is eligible for the degree of Doctor of Medicine.

It should be understood, however, that admission to Columbian College does not guarantee admission to the School of Medicine and Health Sciences.

### *Joint Master of Science and Doctor of Medicine*

The departments of the School of Medicine and Health Sciences cooperate with the Graduate School of Arts and Sciences in offering programs leading to the joint degrees of Doctor of Medicine and Master of Science in the fields of biochemistry, genetics, microbiology, mycology, pharmacology, and physiology.

Students in the School of Medicine and Health Sciences who wish to pursue a joint degree program must meet the requirements for admission to the Graduate School of Arts and Sciences. They must be recommended by the chair of the department, the Dean of the Graduate School of Arts and Sciences, and the Dean of the Medical Center, for Academic Affairs.

The Master of Science program consists of a minimum of 30 semester hours of credit. A maximum of 12 semester hours of credit for graduate-level courses completed as a part of the Doctor of Medicine degree curriculum (and not already applied toward the bachelor's degree) will be allowed in fulfillment

of the requirements of the Master of Science degree. The remaining 18 semester hours of work, which in most programs includes a thesis, must be work in the basic medical sciences normally required for a Master of Science degree in the Graduate School of Arts and Sciences.

### *Joint Doctor of Medicine and Doctor of Philosophy*

In cooperation with the Graduate School of Arts and Sciences, a dual program is available to qualified students who seek both the Doctor of Medicine and Doctor of Philosophy degrees. The requirements that must be fulfilled for both degrees are identical to those currently and separately established in the School of Medicine and Health Sciences and the Graduate School of Arts and Sciences.

To enter the joint degree program, a prospective student must apply for and gain admission to both the Graduate School of Arts and Sciences and the School of Medicine and Health Sciences. If admitted to both schools, the student may apply for affiliation with the joint degree program. Work toward the Ph.D. is performed under the jurisdiction of a departmental doctoral committee and is available in more than 50 research fields.

A student working toward these degrees may apply a maximum of 24 semester hours of approved work taken in the M.D. program toward the minimum of 48 hours of course work required to qualify for the General or Cumulative Examination for Ph.D. candidacy. This course work is normally taken during the semesters that alternate with the medical program and in the years following the award of the M.D. degree. The student's research for the dissertation may begin concurrently with the final 24 semester hours of graduate course work leading to the General or Cumulative Examination. The estimated time for completion of this joint program is six years.

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Details of the requirements for the degrees of Master of Science and Doctor of Philosophy are included in the *Undergraduate and Graduate Programs Bulletin* of the University, available from the Graduate School of Arts and Sciences, George Washington University, Washington, D.C. 20052.

### *Joint Doctor of Medicine and Master of Public Health*

Students who wish to pursue the Master of Public Health in conjunction with the Doctor of Medicine must apply separately to each program. Those admitted must fulfill all requirements for each degree, although a limited amount of credit may be applied toward both degrees with the approval of the Associate Dean for Student Affairs. By taking M.P.H. courses during the summer and elective periods, medical students should be able to complete both degree programs in time to enter residency training on the usual schedule. For specific requirements of the M.P.H. program, see the description beginning on page 42.

## Regulations for M.D. Candidates

A. **General**

1. Using the guidelines below, the Educational Planning Committee will periodically determine and report to the Faculty Senate on the

appropriateness and number of credits for all courses.

First and Second Year Courses:

a. Lecture courses: one semester hour for each hour of lecture time per week per semester, adjusted as appropriate.
b. Laboratory courses: one semester hour for each two or three hours of laboratory time per week per semester, adjusted if appropriate.

Third and Fourth Year Courses:

c. Clinical courses: five semester hours for each four weeks of clerkship; three semester hours for two week clerkships.

2. The minimum academic requirement for the M.D. degree will be the completion of all courses designated by the Faculty Senate to be required, and a passing grade in all courses taken, whether required or not, other than electives in the first and second years.

B. **Evaluation of Academic Performance**

1. Faculty are responsible for evaluating the performance of students in a meaningful, useful and timely manner.
2. A pre-clinical evaluation form will be used in all first and second-year courses. This form will be prepared in triplicate at the end of each course and distributed as follows: one copy to the Dean for Academic Affairs, to be included in the student's file; one copy to the Department; and one copy to the student.
3. A clinical evaluation form will be used in all third and fourth-year courses. This form will be prepared in triplicate at the end of each clerkship or elective and distributed as follows: one copy to the Dean for Academic Affairs, to be included in the student's file; one copy to the Department; and one to the student. This form shall:
   a) list the attribute being evaluated;
   b) provide for indication of the quality of performance; and
   c) provide space for written comments, which are required.
4. Each Department offering required courses should designate an evaluation coordinator to be in charge of student evaluation.

C. **Grades**

1. The authority for the assignment of grades rests primarily with academic departments or with interdisciplinary faculty. Exceptions are grades of Incomplete and Withdrawal (see below) which may be assigned only for reasons acceptable to the Dean for Academic Affairs
2. Departments are responsible for the assignment of grades on a rational, just and unbiased basis.
3. The grading system for all non-required electives will be:

   Pass (P) Fail (F)

   For all required courses and senior electives, the grading system will be:

   Honors (H) In Progress (IP)
   Pass (P) Incomplete (I)
   Fail (F) Withdrawal (W)
   Conditional (CN) Exempt (EX)

4 The following definitions apply

*Honors (H)*

Those students whose performance in a subject is determined by the concerned department to be of superior quality and who, in addition, have demonstrated at the highest level those qualities of intellectual curiosity, motivation and self-discipline which clearly set them apart from the majority of the group, may be assigned the grade of Honors (H).

*Pass (P)*

All students, with the exception of those defined above, whose performance in a subject at least meets the requirements established by the concerned department, shall be assigned a grade of Pass (P).

*Fail (F)*

Those students whose performance in a subject clearly falls below departmental passing standards that limited remedial work would be inadequate to correct the deficiencies, shall be given a grade of Fail (F).

*Conditional (CN)*

Those students who do not meet the minimum requirements established by the concerned department but who could reasonably be expected to do so through a limited program of remedial work developed by the department and approved by the Committee on Educational Evaluation, shall be assigned the grade of Conditional (CN).

*In Progress (IP)*

The notation of IP will be assigned to students in courses which require more than one semester for completion. A grade will be assigned upon completion of the entire course in a subsequent semester.

*Incomplete (I)*

The notation of I will be assigned when a student fails to complete all the required work in a course for reasons acceptable to the Dean for Academic Affairs. Assignment of an Incomplete requires the prior approval of the Dean for Academic Affairs or his designee on a case-by-case basis. A student in the first or second year may not proceed into the work of the following year until a grade of I has been removed; if not removed, a grade of F will be changed automatically to a grade of F after one year. A student in the third or fourth year must remove a grade of I prior to graduation.

*Withdrawal (W)*

The notation of W will be assigned only when a student is unable to continue in the course for reasons acceptable to the Dean for Academic Affairs. Such reasons may *not* include scholarship.

***Exempt (EX)***

The notation of EX will be assigned when a student is excused by a department from taking a required course on the basis that he is already proven competent in the subject; or when a student

given credit for passing an equivalent course in another institution.

5. All departments should submit F and CN grades to the Office of the Dean for Academic Affairs as soon as possible after the completion of a course or clerkship.

A grade of F requires that the student repeat the course or an equivalent remedial experience at this or some other institution, approved by the department and the Dean for Academic Affairs prior to proceeding to the work of the following year. Upon completion of the requisite course with a grade of Pass (P) or its equivalent, the student shall be permitted to continue in the M.D. program and the grade of F will be converted to F P if the passing grade was given by our faculty, or F EX if the course was taken in another institution. The grade of CN is not a passing grade and must be upgraded prior to the beginning of the next academic year, or in the case of clinical subjects, prior to graduation. Upon certification by the department that the student has attained suitable proficiency in the subject, the student shall be permitted to continue in the M.D. program and the grade of CN will be converted to CN/P. A student may, in lieu of such a program, elect to repeat the course at this or any other institution which is approved by the concerned department. A grade of Pass (P) or better shall then result in conversion of the CN to CN EX.

Failure to upgrade a CN to CN P or CN EX by one of these procedures within the prescribed period shall result in automatic conversion of the CN to CN F.

6. As soon as possible after receipt of grades, the Dean for Academic Affairs will inform the Committee on Educational Evaluation of the names of all students receiving grades of F or CN and submit their records to the Committee for evaluation and recommendations.

7. (The process defined below is designed to provide that protection against improper academic evaluation guaranteed by Section 2 B of the Statement of Student Rights and Responsibilities.)

If a student feels an evaluation or grade to be unjust or inaccurate, s he may, within five (5) days of receiving the grade, appeal to the signer of the evaluation for a hearing, simultaneously notifying the Chairperson of the Department. The signer of the evaluation must respond to the student quickly. Failure of the student to initiate such an appeal within five days indicates acceptance of the grade, unless an extension of the time limit is indicated for extenuating circumstances acceptable to the Associate Dean for Student Affairs. From this point on, the Associate Dean for Student Affairs will monitor the process to assure that it moves forward in a timely manner.

If a student remains dissatisfied, s he should appeal in writing to the Chairperson of the Department or clinical division promptly for reconsideration of the evaluation. The Chairperson shall conduct a review, consulting as appropriate with other faculty and staff, and informing the student in writing of the Chairperson's determination at the earliest possible time. If the student remains dissatisfied, s he may appeal in writing to the Associate Dean for Student Affairs. The Associate Dean or his her designee will attempt to arbitrate by conferring with the student and authorities within the Department.

Should that fail to resolve the complaint, the Associate Dean wi establish an ad hoc committee to review the complaint. The Commit tee will consist of four persons, at least one of whom will be a student and none of the Committee members will be from the department against which a complaint has been registered. The task of the Committee will be to advise the Associate Dean for Student Affairs about (1) whether or not the evaluational or grading procedures used in that particular case were essentially the same as those used for other students in that course; and (2) whether or not there is sufficient evidence of an unjust or erroneous evaluation to warrant referral of the case back to the Department for reassessment of the student's competence. Acting upon the Committee's advice, the Associate Dean will either accept the original grade and/or evalua tion as valid, or refer the case back to the Department for reevalua tion and/or grading of the student. The Associate Dean in cooperation with the Department Chairperson will determine an appropriate procedure for reevaluation and/or grading of the student. If the student or faculty member chooses to contest further the joint decision of the Chairperson and Associate Dean, or if these two administrators are unable to reach agreement, the Dean for Academic Affairs will review the situation and render a final decision on the reevaluational process. In every case, authority to evaluate and grade students resides in the academic department.

D. **Academic Dismissal**

1. The Dean for Academic Affairs may dismiss a student for academic reasons on recommendation of the Committee on Educational Evaluation.
2. The Committee on Educational Evaluation will make its recommendations to the Dean for Academic Affairs after careful review considering the total number of credit hours of CN and F grades in courses and electives (except first and second year electives) attained by the student during the M.D. program. Conditional grades which have been remedied to CN/P and failing grades which have been remedied are calculated as conditional and failing grades, except in the case of a student who has been permitted to repeat a semester or year. In such cases, the initial grades will not be counted for possible dismissal.
3. The following regulations establish the conditions under which Academic Dismissal may be recommended:

   A student a) who received grades of F in required courses totalling 14 or more semester hours in any academic year; or b) who receives grades of CN and F in required courses totalling more than 20 semester hours of work in any academic year; or c) who received grades of F in more than 20 semester hours of required work in the M.D. program; or d) who receives grades of CN and F totalling more than 30 semester hours of required work in the M.D. program; or e) who fails to meet any specific requirements previously specified for that student by the Dean for Academic Affairs as a condition for continuation in the program; or f) whose knowledge, competencies and personal characteristics have not achieved, in the judgement of the Com

mittee on Educational Evaluation and the Dean for Academic Affairs, a satisfactory level of development and integration at any stage of training to justify continuing him/her as a reasonable candidate for the M.D. Degree (see also Section F) will be subject to dismissal from the M.D. Degree program.

E. **Irregular Progress**

1. Repetition of a Year

Upon the advice of the Educational Evaluation Committee, the Dean for Academic Affairs may *require* that a student in academic difficulty repeat a year; or may *permit* a student at risk for dismissal to repeat a year. Requiring repetition of a year would be an option where there was a pattern of academic problems which would be difficult or impossible to remedy before the beginning of the next academic year. Allowing a student to recycle would be an option where the student was subject to dismissal on academic grounds, but showed promise of mastering academic material on an additional attempt, and of proceeding without further major difficulty toward becoming a competent physician.

A student eligible for promotion may be allowed to repeat a year at his/her own request.

2. Leaves of Absence

Leaves of absence may be granted at the discretion of the Associate Dean for Student Affairs.

3. Withdrawal from the M.D. Program

Withdrawal from the M.D. program is anticipated by the Administration to be permanent. In the event that a student later changes his/her mind and wishes to re-enter the program, s/he must reapply through the Admissions Committee as any other candidate for medical school.

F. **Evaluation of Professional Comportment**

This policy has been reviewed by the University Board of Trustees and established to accommodate the unique curriculum and degree requirements of the Medical Center. Unless the University Provost decides in a particular case to have the case processed under the University Guide to Student Rights and Responsibilities, all cases involving misconduct by M.D. candidates will be processed under these regulations.)

Occasionally, by his/her behavior or pattern of behaviors--a student may raise concern as to his/her suitability to continue in the study of medicine. It is impossible to catalogue all behaviors which might raise serious questions as to a student's competence to continue in medical school. A process which is described below has been adopted by the Faculty Senate. It is intended to deal with behaviors which may be unacceptable or dangerous to the public if carried into the practice of medicine.

1. The following steps will be the process for identifying and dealing with students with serious problems relating to professional comportment.

a. When a problem is perceived, the observer will communicate with the Associate Dean for Student Affairs. If the communica-

tion is verbal, it must be confirmed immediately by a signe letter which will be placed in the student's confidential file which will be located in the Academic Dean's office. Access restricted to the student under consideration, the Dean fo Academic Affairs, and the Associate Assistant Deans for Student Affairs and for Education or their designees and, where appropri ate, the Subcommittee on Professional Comportment of the Educational Evaluation Committee. This file will be maintained until the student is awarded the M.D. degree, or until s withdraws, transfers or is dismissed from the University f academic reasons. This file and its contents will be destroyed unless the Committee on Educational Evaluation has acted t make it part of the student's permanent record. In any case which a student is dismissed from the University for nonacadem ic reasons, the contents of the file will be preserved permanently as a part of the student's record.

This process may be initiated by the Committee on Educationa Evaluation when it is suspected that academic deficiencies ar the result of psychological, medical, or behavioral problems

b. The Associate Dean for Student Affairs (or his/her designee must meet with the student as soon as possible. Options for th Associate Dean would include (but not be limited to):

(1) advising the medical student but taking no further actio

(2) recommending that the student seek professional assistance for personal problems which may be impairing professiona performance.

(3) developing additional information through contacts with the student, his or her peers, faculty and/or professional consu tants. For example, the Associate Dean may, with the student's concurrence, refer the student for medical or ps chological evaluation. The charge for such an evaluatio would be paid by the School of Medicine and Health Sc ences, and the professional consultant would be requested to make a written report for inclusion in the student's confiden tial file.

(4) Referring the case to the Subcommittee on Professiona Comportment. This Committee will consist of two student from the third or fourth year of the M.D. degree program an two full time faculty, at least one of whom shall be a member of the Educational Evaluation Committee. No administra tive officer, including departmental chairpersons, coo coordinators or residency training program directors will be eligible to serve on this Subcommittee. Appointment will be for a term of one year. Tenure on the Subcommittee will no exceed three years. The Committee and its chairperson w be named by the chairperson of the Educational Evaluation Committee. Students will be chosen from three third year and three fourth years students nominated by the Student Council, the others to be retained as possible alternates. A members of the Subcommittee will have voting privileges and decisions will be made by majority vote with all fou

members being present. Minutes of the Subcommittee will be kept in the student's confidential file. The chairperson may keep duplicate records for the duration of the review, but these are to be returned to the Dean's Office at the end of the process.

c. If it is sent a case for review, the Subcommittee will be responsible for gathering information from individuals who may include (but not be limited to) the student in question, his/her peers, faculty, the administration of the medical school, and, where deemed appropriate, professional consultants on medical or psychological aspects of the problem. While meetings of the Subcommittee are confidential, the student in question and or his her counsel may attend information gathering sessions as observers.

d. If the professional evaluation is requested by the Subcommittee, referral wil be made by the Associate Dean for Student Affairs or his/her designee. As described in 1b(3) above, the cost of this evaluation would be borne by the School of Medicine and Health Sciences and a written report requested for inclusion in the student's confidential file. In contrast, a recommendation for the student to seek professional assistance would remain the concern of the student and not of the School of Medicine and Health Sciences. No contacts by the School will be made to that professional and the expense will be borne by the student.

e. The Subcommittee will make a disposition regarding each case referred to it as soon as possible. Possible dispositions would include (but not be limited to) advising the student, referring the student for professional assistance for any medical or psychological problem at his/her expense, recommending modification in the student's academic program, and recommending temporary suspension or permanent dismissal from the M.D. program. Any recommendation for modification in the academic program requires that the case be reviewed by the parent committee. The student and, if s/he wishes, the student's counsel may be present during the presentation of information at such a review.

f. The Subcommittee and or the parent committee will submit recommendations to the Dean for Academic Affairs or his her designee.

2. Right of appeal will be as follows: The student will be informed of his her right to request review by the next higher authority: i.e., the Subcommittee on Professional Comportment, the Educational Evaluation Committee, the Dean for Academic Affairs, and, finally, the Vice President for Medical Affairs.

G. **Academic Dishonesty**

(This policy has been reviewed by the University Board of Trustees and established to accommodate the organizational and committee structure of the Medical Center. In cases of academic dishonesty involving M.D. candidates which may arise from within the Medical Center, this policy will be used instead of the University Policy on Academic Dishonesty adopted August 8, 1977.)

1. The Medical Center community, in order to fulfill its purpose, mu
assure integrity of behavior in the academic enterprise, establishi
and maintaining guidelines as necessary to do so. All members of t
community are expected to exhibit honesty in their academic wor
Medical students are assumed to be familiar with commonly-unde
stood principles of academic honesty, and with such examples
dishonest behavior as copying answers on examinations, using una
thorized aids to memory in examinations, plagiarizing, presenta
papers which were purchased or otherwise acquired as of one's ow
authorship, and falsifying clinical or research data. They have
special responsibility to learn and observe any special procedure
established within the Medical Center to assure integrity of academ
behavior. Failure to act in accordance with such procedures will b
considered academic dishonesty.

2. All members of the community—students, faculty and staff—have
responsibility to prevent acts of academic dishonesty, or if they hav
occurred, to note and act upon them and to keep them from recurring

3. Procedures

The remainder of this statement aims solely at informing members o
the medical community of their rights and responsibilities wit
respect to academic dishonesty.

Reports of incidents of academic dishonesty which come to the
attention of faculty members, Medical Center staff or students, are t
be made by completion of the form entitled "Charge of Academic
Dishonesty," after consultation with the departmental chairperson,
course coordinator or director of the service, as appropriate. This
form, which identifies the student, describes the nature of the charge
and includes supporting evidence, should be forwarded to the Dean
for Academic Affairs and should remain confidential.

Upon receipt of the form, the Dean for Academic Affairs will meet
with the student to discuss the charge and supporting evidence, t
present the student with a copy of the charge and with a copy of the
"Regulations for M.D. Candidates."

If the accusor, the student and the Dean for Academic Affairs agree
on the accuracy of the charges, the fact of this agreement shall be
noted by the signatures of all three parties on the form and the case
will be referred directly to the Educational Evaluation Committee for
recommendation of appropriate sanctions and modification of the
academic program if necessary.

If the student or the Dean believes the charge(s) not to be accurate
the case will be referred to the Educational Evaluation Committee for
review by the Subcommittee on Professional Comportment. The
proceedings of the Subcommittee and/or the parent committee shall
be conducted as described in Section F 1 b (4) of these regulations.

4. Sanctions

In addition to any other disposition available under Section F above,
more of the following sanctions must be invoked by the Dean for
Academic Affairs after considering the recommendation of the Educa
tional Evaluation Committee.

a) Discarding the work product, which might result in an "Incom
plete," with the requirement that the student satisfactorily

complete compensatory work, or be reevaluated on relevant material.

b) A notation of "Dropped from the course for academic dishonesty" to appear on the transcript, to be expunged one year after imposition of the penalty, or upon graduation, whichever occurs first. Such a notation will not contribute to jeopardy for academic dismissal, but would require repetition of the course if the course is required.

c) A notation of "Dropped from the course for academic dishonesty" to appear on the transcript, with the notation appearing permanently on the record. Such a notation will not contribute to jeopardy for academic dismissal; but would require repetition of the course if the course is required.

d) Expulsion of the student from the School of Medicine, with the notation of "Academic Dishonesty" placed on the permanent record.

5. Safeguards During Procedure

Should the review and any appeal procedures not be completed before the date on which grades are submitted by the Department, the grade "Incomplete" will be recorded for the student in that course until the charges have been fully adjudicated. The student will not be prevented from meeting other academic requirements—such as taking Part I of the National Boards Examination or entering into the matching—prior to the imposition of sanctions and completion of all appeals that are to be undertaken. If the student voluntarily withdraws from the institution prior to completion of the review process, the following notation will be placed on his/her transcript:
"Withdrew following accusation of academic dishonesty prior to completion of review and determination."

6. Supplemental Guidelines

All departmental chairpersons, course and clerkship coordinators are responsible for informing faculty and staff members about the foregoing statement. Chairpersons are also responsible for publicizing to their students, faculty and staff any supplemental departmental guidelines for academic honesty appropriate to their discipline.

H. **Policy on Promotions and Graduation—Academic Requirements**

1. In general, promotion from one year to another—and recommendation to the Faculty Senate for award of the M.D. degree—will be automatic upon achievement of academic requirements. Under exceptional circumstances, when evaluation of personal comportment is pending or completed under procedures described in Section F, promotion or graduation may be postponed, denied or subject to additional requirements set for individual students by the Dean for Academic Affairs.

2. Specific Requirements

a) Year I to Year II. Successful completion of all required work of the first year, with performance at least at the passing level (see Section A 2). The student may not begin the work of the second year until all deficiences of the first year– that is, failing or conditional grades in required courses—have been satisfactorily remedied

b) Year II to Year III: Successful completion of all required work
the second year, with performance at least at the passing lev
(see Section A 2). In addition, receipt in the Dean's office of score
on Part I of the National Board of Medical Examiners examina
tion. The student may not proceed with the work of the third yea
until all deficiencies in work of the second year have bee
satisfactorily remedied.

c) Year III to Year IV: Successful completion of all require
clerkships of the third year with performance at least at the
passing level. A student may be permitted to matriculate in the
fourth year despite unremedied deficiencies in the third year
performance if those deficiencies are to be remedied prior t
graduation during time which would otherwise be available to
the student as elective time or vacation.

d) Eligibility for Graduation: Students will be recommended to the
Faculty Senate to be awarded the M.D. degree upon completion
the minimum academic requirements described in Section A -
(completion of all courses designated by the Faculty Senate to be
required, and a passing grade in all courses taken, whether
required or not, other than electives in the first and second
years); and fulfillment of any additional conditions relating to
personal comportment imposed by the Dean for Academic Affairs
(see Section F).

**I. Application for Graduation**

Application and fee for graduation must be filed in the office of the Dean
for Academic Affairs at the time of registration for the last semester of the
fourth year.

**J. Presence at Graduation**

A candidate is required to be present at the graduation exercise unless
written application for graduation *in absentia* is approved by the Dean for
Academic Affairs.

## Financial Aid

All policies regarding student eligibility for financial assistance from institutional and government sources are stated in the *Financial Aid Memo*, published annually by the School. Assistance is awarded primarily on the basis of demonstrated financial need. In addition, recipients must be enrolled in regular attendance, and making satisfactory academic progress in accordance with the Regulations for M.D. Candidates.

The *Financial Aid Memo* and application materials are available from the Financial Aid Office of the Medical Center, Ross Hall, Room 713, 2300 I Street, N.W., Washington, D.C. 20037. Students who wish to be considered for the loans and scholarships listed below must complete an application for financial assistance each year. The deadline for submission of financial aid applications is April 15, unless otherwise noted.

## Satisfactory Academic Progress

The academic requirements of the M.D. program are rigorous, and the progress of each student is carefully monitored. Students are not allowed to continue their course work at the School if they are not considered by the faculty to be capable of attaining the M.D. degree. Therefore, matriculated students who have not withdrawn or been dismissed are considered to be in good standing and making satisfactory academic progress.

As a rule, the M.D. program is completed in four years of full-time study. In some instances, however, the student may be required or permitted to repeat a year (see **Irregular Progress, page 31**). Students making irregular progress are nonetheless considered to be making satisfactory academic progress, even though the time taken to complete the degree may exceed four years. The specific standards of progress used in determining eligibility for financial aid are as follows:

1. Students who successfully complete required course work within the academic year and move on to the next year's set of requirements meet the satisfactory academic progress criterion for financial aid eligibility and have four consecutive academic years in which they may be eligible to receive financial aid. Students who are having academic difficulty but are able to complete necessary remediation before the beginning of the next academic year are also eligible to receive financial aid for four consecutive academic years.

2. Students may require additional time to complete course work due to academic or personal difficulties. In such situations, the Educational Evaluation Committee and the Associate Dean for Student Affairs may establish a schedule for the student that departs from the norm and may require repeating a year of study. For such students, the maximum time frame for financial aid eligibility shall be seven (not necessarily consecutive) years.

3. Any period of time spent on approved leave of absence shall be excluded from the maximum established time frame. Students are ineligible for financial aid funds while on leave of absence.

4. Students who are registered through the Office of University Students are not eligible for financial aid funds through the School of Medicine and Health Sciences. In these cases, the University Office of Student Financial Aid determines financial aid eligibility.

***Documentation.*** Certification of the satisfactory academic progress of each student receiving financial assistance will be provided to the financial aid office by the Associate Dean for Student Affairs. This certification becomes part of the student's permanent file.

***Appeals.*** The Dean for Academic Affairs will be responsible for hearing appeals regarding satisfactory academic progress. The financial aid office will accept the decisions of the Dean for Academic Affairs.

## Scholarships

Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholarship
Anna Bartsch Scholarship Fund (1946)
Jack I. Bender Scholarship Fund (1967)
Everett Lamont Bradley Scholarship Fund (1954)
Elma B. Carr Scholarship Fund (1976)
Agnes Neuser Chowe Scholarship Fund

Dr. Edith SeVille Coale Scholarships (1965)
Joseph Collins Foundation Scholarships (1951)
Columbian Women Scholarship Funds*
- Estelle M. Corbett Scholarship Fund (1973)
- Jessie Fant Evans Scholarship Fund (1967)
- Lewes D. and Myrtle H. Wilson Memorial Scholarship Fund (1926)

Oliver C. Cox Scholarship Fund (1973)
Morris H. and Pauline L. Goldenberg Scholarship Fund (1979)
Joan Luria Hines Scholarship (1968)
Alex Horwitz Grant (1987)
Albert A. and Esther C. Jones Scholarship Fund (1981)
Ki-Wives of Washington Scholarship Fund (1958)
Sidney A. Levine Scholarship Fund (1971)
Barbara Logan, M.D., Scholarship Fund (1980)
Loughran Medical Scholarship (1976)
Medical School Student Financial Assistance Fund (1981)
Medical Student Summer Research Scholarships
Dan Pollin Medical Scholarship Fund (1980)
Morris H. and Helen K. Rosenberg Medical Scholarship Fund (1986)
David Perry Steinman Memorial Scholarship Fund (1960)
Surdna Foundation Student Aid Fund (1985)
James J. Whisman Scholarship Fund (1966)
Gordon Fay Willey Scholarship (1974)
Winslow Foundation Scholarship (1974)

### *Loan Funds*

Morris and Gwendolyn Cafritz Foundation Loan Fund for Medical Students (1977)
Carroll Memorial Loan Fund (1981)
Eugene B. Casey Revolving Loan Fund (1988)
Consolidated Medical Student Loan Fund
- A.M.A. Medical Student Loan Fund (1964)
- Doreen and Donald Brown Loan Fund
- Carr Loan Fund (1962)
- Himes Loan Fund (1957)
- Kellogg Medical School Loan Fund (1942)
- Pfizer Loan Fund (1953)
- School of Medicine Student Loan Fund (1952)
- Sutherland Loan Fund (1941)
- Wrather Loan Fund (1967)

Abraham I. Gimble Medical School Loan Fund (1977)
Katharine Graham Medical School Loan Fund
Dr. Esther A. Nathanson Memorial Medical Loan Fund (1977)
Student Council Loan Fund (1977)
Waller Loan Fund (1973)
Janice and George Wasserman Medical Student Loan Fund (1978)

*The Columbian Women Scholarships are awarded to women who have completed a minimum of 15 hours at this University with a minimum *B* (3.0) average, or the equivalent. A letter of application for these scholarships should be addressed to the Chairman, Columbian Women Scholarships, care of the Alumni Office, George Washington University, Washington, D.C. 20052, no later than January 18.

In addition to the institutional loan funds listed above, two government loan programs are available to students pursuing the Doctor of Medicine. The *Health Professions Student Loan Program* and the *Perkins Loan Program* both require that students be citizens or permanent residents of the United States, be in good standing with the School, and have exceptional financial need as determined by federal regulations.

### Veterans Benefits

The Veterans Benefits Office, located on the third floor of Rice Hall, 2121 I Street, N.W., assists students entitled to educational benefits as active-duty personnel, veterans, or widows or children of deceased or totally disabled veterans with any problems that may arise concerning their benefits. The office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as active-duty personnel, veterans, or dependents of veterans should consult with the veterans counselor prior to submitting an application to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and includes other information of general interest.

The Veterans Administration is located at 941 North Capitol Street, N.E., Washington, D.C. 20421.

## Awards

***Janet N. Glasgow Award of Outstanding Achievement, American Medical Women's Association, Inc.*** Awarded annually if the student ranking first in the graduating class is a woman.

***American Medical Women's Association, Inc., Scholarship Achievement Citation.*** Awarded annually to those female students who are considered "honor graduates."

***CIBA–Geigy Award for Outstanding Community Service.*** Awarded annually to a member of the sophomore class who has performed laudable extracurricular activity within the community.

***Paul L. DeWitt Award for Surgical Excellence.*** Awarded annually to a member of the graduating class who has demonstrated outstanding ability and future potential in the specialty fields of surgery.

***Samuel M. and Miriam S. Dodek Award (1967).*** Established in memory of Professor Bernhard Zondek, the eminent discoverer of the endocrinology of the human female reproductive cycle. Awarded annually to a member of the graduating class who has attained a commendable knowledge and understanding of the field of female endocrinology.

***Allie S. Freed Award (1957).*** Awarded annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of preventive medicine.

***Walter Freeman Award (1966).*** Awarded annually to a student in the graduating class who submits the best essay based on original investigation.

***Donald H. Glew Memorial Awards.*** Awarded annually to the winners of the Beaumont Day Competition in student research.

***James Douglas Goddard Award in Pharmacology.*** Awarded annually to the outstanding sophomore medical student in pharmacology.

***Alec Horwitz Award (1959).*** Awarded annually to a senior who ha demonstrated exceptional proficiency in the field of surgery.

***Alec Horwitz First-Year Scholar Award (1986).*** Awarded annually to th member of the second-year class who had the highest percentage of semeste hours graded at the *Honors* level during the first year.

***Alec Horwitz Memorial Award (1984).*** Awarded annually to a member the sophomore class who attains the highest score on the National Board Medical Examiners Part I examination.

***Oscar Benwood Hunter Award (1952).*** Established by the George Wash ington University Medical Society, now known as the George Washingto University Medical Alumni Association. Awarded annually to a member of th graduating class who has demonstrated outstanding ability in pathology.

***Jacobi Medical Society Award (1962).*** Established in memory of Dr Abraham Jacobi, the founder of pediatrics practice in the United States Awarded annually to a member of the graduating class who has demonstrated outstanding ability in pediatrics.

***Howard Kane–A.F.A. King Obstetrical Society Award (1937).*** Established in memory of Dr. Howard Kane and Dr. A.F.A. King, who served as professors in the School of Medicine and Health Sciences. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in obstetrics and gynecology.

***Dr. Harold Lamport Biomedical Research Award.*** Established by the Lamport Foundation in memory of the late, distinguished physiologist, Dr. Harold Lamport. Awarded annually to the student writing the best paper on original laboratory investigation in physiology.

***Lange Medical Publications Award.*** Awarded annually to two members of the graduating class who are considered outstanding.

***Huran W. Lawson Award (1957).*** Established by Mrs. Lawson in memory of her husband, who was a distinguished member of the Medical Staff of the University. Presented annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of obstetrics and gynecology.

***Lemmon Company Student Award.*** Awarded annually to a member of the graduating class who has demonstrated outstanding ability in medicine.

***Benjamin Manchester Award (1966).*** Established by a grateful patient in honor of Dr. Benjamin Manchester, clinical professor of medicine. Awarded annually to a member of the graduating class who has an outstanding record and shows promise of real humanitarianism in the practice of medicine.

***Merck Manual Awards.*** Awarded annually to four members of the graduating class who show high scholastic achievement in medical studies.

***Julius S. Neviaser Award (1956).*** Awarded annually to a member of the graduating class who has demonstrated outstanding ability in the clinical aspects of orthopaedic surgery.

***John Ordronaux Award (1907).*** Awarded annually to the member of the graduating class who has the highest scholastic standing.

***Hyman R. Posin Award (1982).*** Established by Sheila Sloane Dussea Awarded annually to a member of the graduating class who has demonstrated outstanding sensitivity to neurologic patients and superior knowledge in neurology.

***Walter F. Rosenberg Award (1980).*** Awarded to the senior medical student who shows the greatest interest, proficiency, and scholastic achievement in dermatology.

***Sandoz Award.*** Awarded annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of psychiatry.

***William G. Schafhirt Award.*** Awarded annually to a senior student for the best original essay or thesis on some medical subject of current public interest.

***Upjohn Achievement Award.*** Awarded annually to a member of the graduating class selected by his or her classmates on the basis of outstanding scholastic and personal achievement.

## Honor Societies

***Alpha Omega Alpha.*** Third- and fourth-year candidates for the M.D. degree meeting the qualifications specified by the constitution of this national medical honor society are eligible for election to membership.

***William Beaumont Medical Society.*** Medical students who have performed original research in the life sciences are eligible for membership, based on the submission of an acceptable abstract of the research and election by society members. Outstanding students present their research findings at the annual Student Research Day. The society also sponsors guest lectures in medical research and assists students in finding research opportunities within the Medical Center.

***Howard Kane–A.F.A. King Obstetrical Society.*** The 15 third- and fourth-year candidates for the M.D. degree who maintain the highest grades in their work in obstetrics are eligible for membership.



# The Master of Public Health Degree Program

The School of Medicine and Health Sciences, recognizing the rapid changes under way in health care and the growing need for health professionals skilled in data management, epidemiology, preventive medicine, medical administration, and health policy analysis, offers a curriculum leading to the Master of Public Health (M.P.H.) degree. The program is designed to develop students' understanding of the operation and financing of health services delivery systems and the biological, physical, environmental, and social factors that affect the health of communities. In addition to taking core courses in public health, each student selects a specialty track in epidemiology–preventive medicine or administrative medicine. The program draws upon the resources of the School of Medicine and Health Sciences, the Department of Health Services Administration of the School of Government and Business Administration, the Department of Philosophy of the Graduate School of Arts and Sciences, and the metropolitan Washington public health community.

## Admission

### *Admission Requirements*

To be considered for admission to the M.P.H. program, the applicant must be a physician, physician assistant, or nurse practitioner or must be seeking admission to one of the School's joint programs (M.D.–M.P.H. or Physician Assistant–M.P.H.). Nonphysician applicants must hold a bachelor's degree from an accredited college or university and must submit official scores on the Graduate Management Admissions Test (GMAT), Graduate Record Examination (GRE), or Medical College Admissions Test (MCAT). Physicians must be graduates of accredited schools of medicine and may submit GMAT, GRE, or MCAT scores, although these are not required. Test scores for any applicant should not be more than five years old. Graduates of foreign medical schools must submit scores on the Educational Commission for Foreign Medical Graduates (ECFMG) examination and Federation Licensing Examination (FLEX), if these tests were taken.

### *Application Procedures*

Application forms are available from the M.P.H. Admissions Office, GWU School of Medicine and Health Sciences, Box 32, 2300 I Street, N.W., Washington, D.C. 20037. The completed form must be returned with a nonrefundable $30 application fee, payable by check or money order to the George Washington University. The fee is waived for students applying for readmission who were enrolled as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

Applicants interested in the joint M.D.–M.P.H. program must be admitted to the M.D. program before seeking admission to the M.P.H. program. Such applicants pay only the M.D. application fee.

Those seeking admission to the joint Physician Assistant–M.P.H. program must complete the application forms for each program, available from the

M.P.H. Admissions Office. Such applicants pay only the M.P.H. application fee.

Included with the M.P.H. application are two recommendation forms, which must be completed by individuals familiar with the applicant's professional or academic performance. Recommendations should be submitted directly to the M.P.H. Admissions Office by the evaluators. The applicant must also request official transcripts from *all* institutions attended as an undergraduate or graduate student, regardless of whether credit was earned or desired. Transcripts should be sent directly to the M.P.H. Admissions Office from the registrar of each school. Scores on the GMAT, GRE, or MCAT—if required—must also be submitted directly by the testing agency.

### Admission on Probation

Applicants may be admitted on probation at the discretion of the Admissions Committee. Such applicants are required to register in the fall semester for a minimum of two core courses from their chosen specialty track and to receive a grade of *B* or better in each course in order to be admitted to degree candidacy. Students admitted on probation should consult their advisors immediately after the examination period of their first semester to determine whether the conditions for admission have been satisfied.

### Transfer of Credit

Up to 12 semester hours of applicable graduate course work completed at an accredited university may be accepted in transfer. The course work must have been taken within the past three years, and the student must have earned a grade of *B* or better. Petitions for transfer of credit must be approved by the faculty advisor, the program director, and the dean. Transcripts and descriptions of the courses must be on file before such petitions can be considered.

### International Applicants

***Required Records.*** At the time the application is submitted, the applicant must have the educational institutions previously attended send directly to the M.P.H. Admissions Office copies of official certificates and records listing subjects studied, grades received, examinations taken, and degrees received. Certified copies of diplomas and certificates from all colleges and universities attended are required. These copies become the property of the University and cannot be returned. These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies sent should be accompanied by an English translation.

***Language Test.*** International students who received their degrees from academic institutions in which English was not the language of instruction must show competence in the English language by scoring not less than 550 on the first taking of the Test of English as a Foreign Language (TOEFL) or 600 on the second taking. Applicants are responsible for making arrangements to take the test and should address inquiries to TOEFL, CN 6151, Princeton, N.J. 08541-6151, U.S.A., well in advance of the semester for which admission is sought. On the application for the TOEFL, applicants should specify that their scores be sent to the M.P.H. Admissions Office, GWU School of Medicine and Health Sciences, Box 32, 2300 I Street, N.W., Washington, D.C. 20037. Registration for the TOEFL does not constitute application for admission to George Washington University.

Admitted students who receive a TOEFL score below 600 will be required to take the GWU English as a Foreign Language placement test before registering at the University. The results of this test will determine whether the student must complete English as a Foreign Language course work during the first semester of the M.P.H. program. This requirement may extend the length of time needed to complete the program.

Passing scores on the ECFMG English language test may be submitted in place of TOEFL scores. Applicants who can demonstrate that they have used English extensively in previous training or clinical experience, or can provide other evidence of fluency, may seek permission from the program director to waive the TOEFL requirement or to take the GWU English as a Foreign Language placement test in lieu of the TOEFL.

***Financial Certificate.*** All international students planning to study at the University under the authorization of a student (F) or exchange visitor (J) visa must complete a Financial Certificate and submit it with the application for admission. Satisfactory completion and submission of the Financial Certificate is required for the issuance of a Form I-20 or IAP-66. Students who need F or J visas should submit their applications, required records, and TOEFL scores no later than April 1.

## Joint Programs

Qualified individuals may pursue the Master of Public Health in conjunction with a clinical program leading to the Doctor of Medicine degree or the physician assistant certificate. Students must be admitted to each program and must fulfill all requirements for each degree or certificate.

***Doctor of Medicine and Master of Public Health.*** This joint program is scheduled to allow students to complete both the M.P.H. and M.D. degrees and enter residency training on the usual timetable. Students in the program begin M.P.H. course work in the summer before or after the first year of medical school, taking 6 semester hours in a five-week session that starts in mid-July, and continue to take M.P.H. courses as electives during the first and second years of medical school. Fourth-year medical students in the joint program join full-time M.P.H. students for the spring semester and a five-week summer session that ends in June. The program director must approve the M.P.H. program of study, and the Associate Dean for Student Affairs approves the course of study for the senior year of medical school. The amount of credit that may be applied toward both degrees is determined by the associate dean.

***Physician Assistant Certificate and Master of Public Health.*** Full-time students may complete this joint program in three calendar years. All didactic course requirements of the physician assistant program and most M.P.H. courses are completed during the first two years, while the third year consists primarily of clinical rotations in a variety of health care settings. For specific requirements of the physician assistant certificate program, see page 72.

## Program of Study

### *Prerequisite Courses*

All students must present evidence of a basic knowledge of statistics or satisfactorily complete the autotutorial in biostatistics offered by the M.P.H.

program. Those who pursue the administrative medicine specialty track must also have a basic knowledge of accounting, as demonstrated by satisfactory completion of an introductory accounting course. Credit earned for statistics and accounting courses may not be applied toward the degree.

### Degree Requirements

The Master of Public Health program consists of a minimum of 33 semester hours of course work. Fifteen semester hours of core courses are required for all M.P.H. students—PubH 201, 202, 205, 206, 211, and 213. The remaining 18 hours are taken in a specialty track.

The epidemiology–preventive medicine track offers comprehensive study in epidemiology and its applications to public health, medicine, and clinical research. Course work is designed to develop skills in implementing principles of preventive medicine and epidemiologic analysis. Required courses include PubH 220, 221, 222, 223, 230, 240, and 295.

The administrative medicine track focuses on the administration, financing, management, planning, and marketing of health care and public health systems. Quantitative methods and principles of health systems management are emphasized. Required courses include PubH 214, 230, 296; HSA 211, 215; and an elective chosen from selected course offerings in health services administration.*

Students in one specialty track may take course work in the other only with the permission of the program director.

The student's program of studies must be approved by the faculty advisor and the program director and filed in the dean's office. A program of studies may be revised, when necessary, by obtaining the required approvals and filing the revisions in the dean's office.

### Scholarship Requirements

M.P.H. candidates are required to maintain a minimum cumulative quality-point index of 3.0 in course work required for the degree. Grades in courses taken at other institutions are not considered in computing the quality-point index. For students in the joint M.D.–M.P.H. program, the regulations for M.D. candidates apply to work in all courses credited to the M.D. degree.

A student may repeat a course in which a grade of *C* was received only with the written permission of the faculty advisor and the approval of the program director. If a course is repeated, the first grade remains on the student's record and is included in the cumulative quality-point index.

If a student receives a grade of *F* for a course in the M.P.H. program, the program director will require a written statement from the student's faculty advisor that justifies the student's continuance in the program and outlines the procedure to be followed. Continuation is contingent upon the dean's approval. The failing grade remains as part of the student's permanent record and is included in calculations of the quality-point index, even if the course is repeated.

***Probation and Suspension.*** A student whose quality-point index falls below 3.0 will be placed on probation. This probation extends through the period in which the student next attempts 9 semester hours of work. During

*For descriptions of health services administration courses, see the *Undergraduate and Graduate Programs Bulletin*.

this period the student's performance will be monitored to determine suitability for continued study. Failure to raise the quality-point index to 3.0 may result in suspension.

***Readmission.*** A student who is suspended may apply for readmission after the lapse of one semester. To be readmitted, students must submit written evidence that they are now better prepared to pursue graduate course work. Should the student fail to achieve the minimum quality-point index at the end of the semester following readmission, the student will be recommended for dismissal. Such recommendation will be reviewed by the Dean for Academic Affairs; at the dean's discretion, the recommendation may also be reviewed by a faculty committee.

### *Use of Correct English*

An instructor may inform the program director if a student's written or spoken English in any course is unsatisfactory. The program director, in turn, may refer the student for further evaluation and recommendation.

### *Time Limits*

All degree requirements must be completed within four years of the date of matriculation in the program, except for students in the joint M.D.–M.P.H. program, who have five years. The time limit does not include any period spent on approved leave of absence.

### *Academic Advising*

Each student is assigned a faculty advisor with expertise in the chosen specialty track. The advisor monitors progress and provides information about the curriculum, specific courses of study, and career opportunities.

## Regulations

### *Attendance*

Students may attend only those classes for which they are registered. Regular attendance is expected.

### *Grades*

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *IP*, In Progress; *W*, Authorized Withdrawal; *Z*, Unauthorized Withdrawal.

When another grade has not been assigned, the symbol *I*, *IP*, *W*, or *Z* will be recorded. The grade of *I* indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work for a course. If an Incomplete for regular course work is not made up within one calendar year, it remains permanently as a grade of *I* on the student's record. The grade of *I* cannot be removed by reregistering for the course here or by taking its equivalent elsewhere.

The symbol *IP* is reserved for courses (such as special projects) in which the final class date extends beyond the official University deadline for submitting grades.

For students in the joint M.D.–M.P.H. program, courses applied toward both degrees will be listed on each transcript using the grading system of the applicable program. Grade equivalents are as follows: *A = Honors, B = Pass, C = Conditional, F = Fail.*

## Changes in Program of Study

A student may not change specialty tracks or intended schedule for completion of the program, substitute one course for another, drop courses, or change status from credit to audit or audit to credit without the approval of the course instructor, the faculty advisor, and the dean.

***Adding Courses.*** The deadline for adding a course is the end of the second week following general registration for the semester.

***Withdrawal.*** Withdrawal from a course or from the University requires the approval of the student's advisor, each course instructor, and the dean. Permission to withdraw from the University will not be granted to a student who does not have a clear financial record (see Payment of Fees, page 13). The deadline for withdrawal from a course is the end of the eighth week following general registration for the semester.

All charges for courses from which the student withdraws are subject to the refund policy listed under Fees and Financial Regulations, page 12.

## Credit

Credit is awarded only after registration for a course and satisfactory completion of the required work, or upon approval of a transfer of credit.

## Auditing

A student who has been admitted to the M.P.H. program may register as an auditor in a class only with the permission of the instructor and the program director. An auditor receives no academic credit and is not required to take active part in the class or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit. The on-campus tuition rate is charged for audited courses.

## Continuous Enrollment

Once registered in a degree program, students are expected to be continuously enrolled and actively engaged in fulfilling the requirements for the degree each semester until the degree is conferred. A student who is within the time limits of the degree and has fulfilled all program requirements but is completing outstanding work in a course for which the grade of Incomplete was received must register for Continuous Enrollment each semester. There is no charge for this type of registration.

Students who break continuous enrollment at the University and do not request and receive a leave of absence (see below) must apply for readmission and, if granted, are subject to the requirements and regulations then in force.

## Leave of Absence

A student who must interrupt active pursuit of the degree may petition the program director for a leave of absence for a specific period of time, generally limited to one calendar year. If the petition is approved, students must complete a Continuous Enrollment form and return it to 719C Ross Hall.

Degree candidates who discontinue their studies without being granted a leave of absence and students granted leaves who do not return to active study at the close of the period of approved absence must apply for readmission and are subject to the regulations and requirements then in effect. Students are assessed no fees while on leave of absence.

### *Graduation Requirements*

Degrees are conferred in February, May, and September. Applications for graduation must be filed by October 1 for February graduation, February 1 for May graduation, and July 1 for September graduation. Graduating students may participate in the School of Medicine and Health Sciences commencement ceremony, held each year in May. Students who have completed all requirements but have not been awarded the degreee will be issued a letter to this effect upon request.

To be recommended for graduation by the faculty, students must have completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree; have filed an application for graduation prior to the published deadline; and be free from all indebtedness to the University. Registration, either for course work or for Continuous Enrollment, is required for the semester or summer session at the close of which the degree is to be conferred.

### *Unclassified Students*

With the program director's permission, unclassified students may register for courses in the M.P.H. program if space is available. An unclassified student who is subsequently admitted to the M.P.H. program may apply a maximum of 12 semester hours of credit toward the degree with the approval of the program director.

## Financial Aid

Limited financial aid, primarily in the form of loans, is available to full-time M.P.H. students. A limited amount of fellowship assistance is available to students in the joint M.D.–M.P.H. and Physician Assistant–M.P.H. programs. For further information on financial aid programs and deadlines, including information on veterans benefits, contact the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052. M.D.–M.P.H. applicants should contact the Director of Financial Aid, GWU School of Medicine and Health Sciences, 2300 I Street, N.W., Washington, D.C. 20037.

# Undergraduate Health Sciences Programs

The School of Medicine and Health Sciences offers a broad range of undergraduate programs to prepare allied health professionals for roles in selected disciplines that complement the medical profession. Recognizing the nation's intricately structured health care system, programs emphasize the interdependent roles and responsibilities of the network of professionals who bring a variety of skills and expertise to the health care team. The programs in medical laboratory technique,* nuclear medicine technology, prehospital clinical medicine, radiation therapy technology, and radiologic technology* lead to the Associate in Science. The Advanced Hospital Corps School and nuclear undersea medical technology programs lead to the Bachelor of Science in Health Science,* and the Bachelor of Science is awarded for completion of the emergency medical services, medical record administration, medical technology, nursing anesthesia, physician assistant, and radiologic sciences and administration programs. In addition, certificates are awarded to degree candidates in the following programs who complete designated requirements: medical record administration, medical technology, nuclear medicine technology (on-campus students only), nurse practitioner, nursing anesthesia, physician assistant, and radiation therapy technology. Curricula leading to the certificate only are available in the nurse practitioner, medical technology, and radiation therapy technology programs.

## Admission

Applicants to any of the health sciences programs at George Washington University must submit a completed application form together with a nonrefundable $30 fee. The fee is waived for GWU students who are applying to the clinical (fourth) year of the medical technology program, for off-campus military and other contract students, and for students applying for readmission who were enrolled as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

Application forms are available from the office of the program to which admission is sought, except for the first three years of the medical technology program; such applicants should request forms from the Office of Admissions, George Washington University, Washington, D.C. 20052. Applicants should refer to the individual program descriptions for the appropriate mailing address and for information on additional prerequisites, supporting documents, and application deadlines, since these vary by program. Application forms for readmission are available from the Office of Health Sciences Programs Administration, George Washington University School of Medicine and Health Sciences, 2300 I Street, N.W., Washington, D.C. 20037. Completed applications for admission or readmission must be returned to the Office of Admissions, George Washington University, Washington, D.C. 20052 (off-campus students should return applications for readmission to the Office of Health Sciences Programs Administration.)

*For off-campus military students only.

## Required Credentials

Credentials that must be submitted by all applicants are listed below. Please refer to the individual program descriptions for information on additional admission requirements.

Applicants should note that *official* transcripts and score reports must be forwarded directly to the Office of Admissions from the registrar of all academic institutions previously attended or from the issuing agency. Photocopies are not acceptable.

### *Applicants With No Previous Academic Credit*

1. An official transcript showing that the applicant graduated with an acceptable record from an accredited secondary school.
2. Official scores on the College Board Scholastic Aptitude Test (SAT) or the American College Testing (ACT) battery, if the applicant completed secondary school within two years of the date of application to an allied health program. (If the applicant completed secondary school more than two years before the date of application, other tests may be required during the application process.)*
3. Service school records, where applicable.

### *Applicants With Fewer Than 30 Semester Hours of Academic Credit†*

1. An official transcript showing that the applicant graduated with an acceptable record from an accredited secondary school or has acceptable GED scores.
2. Official SAT or ACT scores, for applicants who completed secondary school less than two years before the date of application.*
3. Official transcripts from each academic institution attended, regardless of whether credit was earned or desired.
4. Service school records or military discharge papers, where applicable.
5. Official College Board College-Level Examination Program (CLEP) score reports, where applicable.

### *Applicants With 30 or More Semester Hours of Academic Credit‡*

1. An official transcript showing that the applicant completed acceptable course work at an accredited college or university, maintained a cumulative grade-point average of 2.0 out of a possible 4.0, is in good standing as to scholarship and conduct, and is eligible to return to the academic institution most recently attended in the same semester for which admission is now sought to George Washington University. Students who have been academically dismissed or suspended more than twice will not be considered for admission for at least five years from the date of their last suspension or dismissal.
2. Service school records or military discharge papers, where applicable.
3. Official CLEP score reports, where applicable.

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*Off-campus military students do not need to submit SAT or ACT scores. The Office of Admissions will notify any student who is required to take other tests.
†Fewer than 12 semester hours for off-campus students.
‡Twelve or more semester hours for off-campus students.

## Students From Foreign Institutions

***Required Records.*** Applicants must request copies of official certificates and records listing subjects studied, grades received, examinations taken, and degrees received from all educational institutions attended. Each institution should mail these credentials directly to the Office of Admissions, George Washington University, Washington, D.C. 20052. Official copies of diplomas and certificates from all secondary schools, colleges, and universities attended are required. Records of state examinations and certificates are also required. These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies sent should be accompanied by a certified English translation. All records become the property of the University and cannot be returned.

***Language Tests.*** Applicants whose native language is not English are required to take the Test of English as a Foreign Language (TOEFL). Such applicants are responsible for making arrangements to take the test and should address inquiries to TOEFL, Educational Testing Service, CN 6151, Princeton, N.J. 08541–6151, U.S.A., well in advance of the semester for which admission is sought. On the application for the TOEFL, students should specify that the scores are to be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052. Registration for the TOEFL does not constitute application for admission to George Washington University.

Admitted students whose native language is not English are also required to take an English as a Foreign Language placement test prior to registering at the University. Depending on the results of this test, the student's academic program may be restricted in number and type of courses that can be taken. College credit is not granted for English study below the level of standard freshman English courses.

***Financial Certificate.*** A Financial Certificate must be completed and submitted with the application for admission of all international students planning to study at the University under the authorization of either a student (F) or exchange visitor (J) visa. Satisfactory completion and submission of the Financial Certificate is required for the issuance of a Form I-20 or IAP-66.

## Advance Tuition Deposit

Upon notification of acceptance, a $100 tuition deposit will be required of all full-time, on-campus undergraduate students, including those readmitted. The deposit is credited toward tuition and is not refundable.

## Admission as an Unclassified Student

A student who wishes to take individual courses in health sciences programs must apply for admission to the University as an unclassified undergraduate student in the School of Medicine and Health Sciences. The Assistant Dean, in conjunction with the appropriate program director and the chair of the department offering the course, will determine whether admission will be granted to unclassified students. Credit earned for courses taken as an unclassified student may be transferred to a degree program at the University if the courses are applicable to the program. Permission to take individual courses, if granted, will generally be limited to a total of 6 semester hours

## Advanced Standing

Advanced standing may be awarded toward the associate's and bachelor's degrees for appropriate course work completed with a minimum grade of *C* at other accredited academic institutions. Advanced standing may also be awarded for nontraditional classroom or clinical experience. The University reserves the right to refuse transfer credit in part or in whole.

Transfer credit is not awarded for English language courses taken in a non-English-speaking country.

Degree candidates who are currently enrolled at this institution and plan to take placement examinations or courses at other accredited institutions for credit must first obtain permission from the Office of Health Sciences Programs Administration.

***Transfer Credit From Academic Institutions.*** Health sciences degree programs vary in the amount of advanced standing they will award. Students may obtain further information from the Office of Health Sciences Programs Administration.

***Credit for Nontraditional Classroom or Clinical Experience.*** Credit may be awarded for nontraditional classroom or clinical experience through one or any combination of the following:

*Credit from Service Schools.* A limited amount of credit may be assigned for selected service school instruction. Current military students must submit an official DD Form 295; copies of service school records are not acceptable. Veterans should submit photocopies of their discharge papers (Form DD214).

*Special Departmental Examinations.* A student may request approval from the Assistant Dean, through the program director, to petition any department to take a special examination covering the subject matter of a specific course. Approval of such a request is not granted automatically; the student must offer evidence of sufficient occupational or educational background to indicate a reasonable command of the subject matter. Assigning credit by special departmental examination will depend on the department's evaluation of the examination. The examinations will normally be of at least three hours' duration. A $50 fee for each course examination is charged for preparing, administering, and grading the examination. (In some instances, students may instead request approval to take a waiver examination to satisfy a curriculum requirement. Students do not receive academic credit for waiver examinations. The examination will normally be of at least one hour's duration; a $20 fee is charged for each waiver examination.)

*Credit for College Board College-Level Examination Program (CLEP).* CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: mathematics, humanities, natural sciences, English composition, and social sciences and history. The CLEP General Examinations in mathematics and English, however, will not fulfill any degree requirements for allied health students; only the Subject Examinations are acceptable in these areas.

Upon admission to degree candidacy, credit is assigned for General Examinations in natural sciences, humanities, and social science and history passed with acceptable scores. Credit is usually assigned for Subject Examinations passed at the level recommended in the College Board model policy. Credit may not be earned by passing the examination after taking an equivalent course. Arrangements for taking the examinations are the respon-

sibility of the applicant and should be made through the College Board College-Level Examination Program, CN 6601, Princeton, N.J. 08541-6601.

*Credit for New York State Board of Regents Examination.* Applicants for degrees who present proper certification of the award of a degree at the associate's level from the New York State Board of Regents may be awarded a maximum of 60 semester hours of advanced standing.

### Readmission

Students previously registered in the University who were not registered the immediately preceding semester (summer sessions excluded) must apply for readmission. Students who have attended one or more academic institutions while absent from this University must have complete official transcripts sent directly to the Office of Admissions from each institution attended. (Active duty or reserve military students who have attended additional service schools must also submit an updated DD Form 295.) Students seeking readmission as degree candidates after previous enrollment in unclassified status must submit all entrance credentials not previously received or required.

Applications for readmission are considered on the basis of regulations currently in effect.

The application fee is waived for students applying for readmission after previous enrollment as degree candidates at this University if they have not since registered at another institution.

## Regulations

### Attendance

Students may attend only those classes for which they are registered. Regular attendance is expected. Students may be dropped from any course for undue absence.

### Scholarship Requirements

***Grades.*** Grades are mailed to students from the Office of the Registrar each semester. Grades are not given out by instructors.

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, In Progress; *W*, Authorized Withdrawal; *Z*, Unauthorized Withdrawal. Other grades that may be assigned are *A*−, *B*+, *B*−, *C*+, *C*−, *D*+, and *D*−. Except for courses that specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat a course in which a grade of *D* or better was received, unless a petition to do so is approved by the Assistant Dean upon recommendation of the program director.

When another grade has not been assigned, the symbol *I*, *IP*, *W*, or *Z* will be recorded. The symbol *I* indicates that the instructor has received a satisfactory explanation for the student's inability to complete the required work of the course. At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course, and if the instructor is informed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a

course that is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. An *I* automatically becomes an *F* if the uncompleted work has not been made up within one calendar year of the date of the last class meeting in the semester for which the *I* was assigned. *IP* is reserved for courses (for example, clinical rotations) in which the final date extends beyond the official University deadline for submitting grades.

***The Quality-Point Index.*** Scholarship is computed in terms of the quality-point index (QPI), obtained by dividing the number of quality points by the number of semester hours for which the student has registered, based only on the student's record in this University. Quality points are computed from grades as follows: *A*, 4.0; *A*−, 3.7; *B*+, 3.3; *B*, 3.0; *B*−, 2.7; *C*+, 2.3; *C*, 2.0; *C*−, 1.7; *D*+, 1.3; *D*, 1.0; *D*−, 0.7; *F*, 0, for each semester hour for which the student has registered. (Grades of *F* will be computed in the QPI but will not be considered as fulfilling degree requirements.) Courses marked *W*, *I*, or *IP* are not considered in determining the index, except that any course in which an *I* or *IP* has been assigned will be included when a final grade has been recorded. Grades earned at other institutions are not included in computing the QPI.

***Dean's List.*** Students who achieve a QPI of 3.5 or higher in any one semester are placed on the Dean's List for that semester. The Dean's List is limited to full-time students.

***Probation.*** A student who has attempted a minimum of 12 semester hours of course work and whose cumulative QPI is below 2.0 will be placed on *academic probation*. This probation extends over the period in which the student attempts another 12 semester hours of course work.

Students whose attendance or conduct has been unsatisfactory may be placed on *disciplinary probation* for the period in which they attempt the next 12 semester hours of course work.

***Suspension.*** Any student whose cumulative QPI remains below 2.0 after a 12-semester-hour period of probation may be suspended. A student suspended for poor scholarship may not register for course work, even as an auditor. A suspended student may apply for readmission after the lapse of either the fall or spring semester following suspension. Evidence must then be presented to the Assistant Dean, through the student's program director, demonstrating that the student is now better prepared to pursue college-level course work. Any student suspended twice for poor scholarship will not be readmitted.

***Dismissal.*** Any student who has received one or more failing grades during a semester may be recommended for dismissal by the program director. Such recommendation will be reviewed by the Assistant Dean and the Dean for Academic Affairs; at the discretion of the Dean for Academic Affairs, the recommendation may also be reviewed by a faculty committee.

### Withdrawal

Withdrawal from a course or from the University requires the approval of the student's advisor, each course instructor, and the Assistant Dean. Permission to withdraw from the University will not be granted to a student who does not have a clear financial record (see Payment of Fees, page 13). The deadline for withdrawal from a course is the end of the fourth week following general registration for the semester (except for off-campus military students).

All charges for courses from which the student withdraws are subject to the refund policy listed under Fees and Financial Regulations, page 12.

### Adding Courses

The deadline for adding a course is the end of the second week followi general registration for the semester.

### Changes in Program of Study

***Changes Within Allied Health Programs.*** A student may not substitut one course for another, drop courses (see Withdrawal), or change status fro credit to audit or audit to credit without the approval of the faculty advisor, th course instructor, and the Assistant Dean.

***Transfer Within the University.*** Application for transfer to anothe college, school, or division must be made to the appropriate admitting office o the form provided by that office. A maximum of 30 semester hours earned i the Division of Continuing Education may be applied toward a bachelor's degree in the School of Medicine and Health Sciences.

### Credit

Credit is awarded only after registration for a course and satisfactory compl tion of the required work, or upon the assignment of advanced standing i accordance with the regulations of the several colleges, schools, and divisions

### Auditing

A student who has been admitted to a health sciences program may register a an auditor in a class only with the permission of the instructor, the faculty advisor, and the Assistant Dean. An auditor receives no academic credit and not required to take active part in the class or to pass examinations. A studen who takes a course as an auditor may not repeat it later for credit. The on campus tuition rate is charged for audited courses.

### Balance Sheet

After a student has been admitted and has completed the registration proces in a particular degree program, program coordinators in the Office of Heal Sciences Programs Administration will issue a balance sheet showing cours work already completed and degree requirements still to be met. A second balance sheet is issued only if the student changes the major.

### Transcripts of Record

Official transcripts of student records are issued on written request of the student or former student who has paid all charges, including any student loan installments, due the University at the time of the request. A fee of $2 is charged for each transcript. Partial transcripts are not issued.

### Continuous Enrollment

Once entered in a degree program, a student is expected to be continuously enrolled and actively engaged in fulfilling the requirements for the degree each semester of the academic year until such time as the degree is conferred. Students who break continuous enrollment at the University and do not request and receive a leave of absence (see below) must apply for readmission and, if granted, are subject to the requirements and regulations then in force.

Special provision is made for military students who have completed the certificate components of their programs but, because of work assignment, cannot immediately complete degree requirements. Such students are registered in Continuous Enrollment until they are able to resume course work.

Students who plan to attend other institutions and apply credit so earned toward graduation from this University must first obtain written approval from the Assistant Dean.

### Leave of Absence

A student who must interrupt active pursuit of the degree may petition the Assistant Dean, through the program director, for a leave of absence for a specific period of time, generally limited to one calendar year. If the petition is approved, the student must complete a Continuous Enrollment form and return it to the Office of Health Sciences Programs Administration. Degree candidates who discontinue their studies without being granted a leave of absence and students granted leaves who do not return to active study at the close of the period of approved absence must apply for readmission and are subject to the regulations and requirements then in force. Students are assessed no fees while on leave of absence. The right to use of University facilities is suspended while the leave is in effect.

### Graduation Requirements

Degrees are conferred in February, May, and September. Graduating health sciences students may participate in the School of Medicine and Health Sciences commencement ceremony, held each year in May.

To be recommended for graduation by the faculty, students must have met the admission requirements of the college or school in which they are registered; have completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree; have filed an application for graduation prior to the published deadline; and be free from all indebtedness to the University. Registration, either for course work or for continuous enrollment, is required for the semester or summer session at the close of which the degree is to be conferred.

***Application for Graduation.*** Applications for graduation must be filed by October 1 for February graduation, February 1 for May graduation, and July 1 for September graduation. (Off-campus military students should apply upon completion of all degree requirements.)

***Scholarship.*** Students must meet the scholarship requirements for the particular degree for which they are registered.

***Curriculum.*** Minimum curriculum requirements for each degree are given on pages 58–71.

### Honors

Bachelor's degrees with honors are awarded to students whose academic records give evidence of particular merit. The student's quality-point index determines the level of honors as follows: *cum laude*, 3.4–3.59; *magna cum laude*, 3.6–3.79; *summa cum laude*, 3.8–4.0.

The quality-point index is calculated by the Office of the Registrar, and the honors designation is entered on the transcript and diploma of those students who earn an honors designation. To be eligible, a student must complete at least 60 hours of course work at GWU.

### *Award of Certificates to Degree Candidates*

Certificates are awarded to degree candidates who successfully comple designated requirements in the medical record administration, medical tec nology, nuclear medicine technology, nursing anesthesia, physician assistan and radiation therapy technology programs. In addition, students must be fre from all financial indebtedness to the University.

## Financial Aid

For full-time undergraduate students, George Washington University has program of financial assistance consisting of scholarships, grants, loans, stu part-time employment. Aid is awarded on the basis of academic achievement and demonstrated financial need.

In general, consideration for financial aid is restricted to students in go academic standing who meet the minimum grade-point average for particula awards and are not financially encumbered by any other University office. Al undergraduate gift aid (institutional scholarships and grants and federa grants) requires that the student be working on the first undergraduate degree. Undergraduate gift aid and all federal aid require that the recipient b registered for a full-time course load at GWU.

Students intending to apply for financial aid should submit the complete financial aid application and the application for admission by March 1, since all applications for financial aid must be filed by that date regardless of whether the student has been admitted yet. Applications for institutional o federal aid cannot be processed if the relevant tax returns have not been fil in accordance with the IRS Code. Documents submitted as part of a applications become the property of the University and cannot be returned. Federal regulations require that the University report suspected cases of fraud or misrepresentation to the appropriate federal, state, and local authorities.

Complete information on financial assistance and the necessary application materials are available from the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

## Programs Leading to the Associate in Science

Satisfactory completion of a minimum of 60 semester hours of course work is required for the degree of Associate in Science; some programs, however, may set requirements above the minimum. See individual program descriptions for information on course distribution.

Students who may wish to pursue a bachelor's degree later are advised to plan their associate's degree program so that, where possible, they will satisfy the prerequisites of the baccalaureate.

### *Scholarship Requirements*

A minimum cumulative QPI of 2.0 is required in course work leading to the degree of Associate in Science. A minimum cumulative QPI of 2.5 is required for course work in the core curriculum. A student whose QPI in the core curriculum falls below 2.5 in any one semester will receive a warning letter.

### Residence Requirement

A minimum of 18 semester hours of course work in the major must be satisfactorily completed in residence at the School of Medicine and Health Sciences.

## Medical Laboratory Technique Program

The program of study leading to the degree of Associate in Science with a major in medical laboratory technique is offered only to off-campus military students.

### Admission to Degree Candidacy

General requirements for admission to degree candidacy are stated on pages 50–54. Students who do not meet these requirements may be considered for admission to degree candidacy upon satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University, with a minimum QPI of 2.5, or upon completion of 15 semester hours of acceptable (2.5) and transferable course work.

### Degree Requirements

The program requires satisfactory completion of a minimum of 61 semester hours of course work, distributed as follows:

***Human Competence.*** 6 semester hours of English composition (Engl 9 or 10 and 11 or 12, or the equivalent) and 6 semester hours of college math or 3 semester hours of college math and a humanities or social science elective.

***Core Curriculum (required courses).*** Path 13, 14, 15, 16, 17, 18, 19, 20; Chem 11 (the latter is not included in computing the QPI). This requirement is fulfilled by successful completion of Medical Laboratory Technique School (NEC 8506).

## Nuclear Medicine Technology Program

The program of study leading to the degree of Associate in Science with a major in nuclear medicine technology is offered to on-campus students and to off-campus military students.

### Admission to Degree Candidacy

General requirements for admission to degree candidacy are stated on pages 50–54. Applicants must be at least 18 years of age by the time they first register in the program. Two letters of recommendation must be sent directly from previous instructors, advisors, or employers (except for off-campus military students). The selection process includes a personal interview for qualified applicants (except for off-campus military students). Enrollment is limited. Students who do not meet the standard requirements may be considered for admission to degree candidacy upon satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University, with a minimum QPI of 2.5, or upon completion of 15 semester hours of acceptable (2.5) and transferable course work.

### *Degree Requirements*

Satisfactory completion of 67* semester hours of course work is required. Ana
115 and Phyl 111, or their equivalents, are prerequisite to all other courses i
nuclear medicine technology.

***Human Competence.*** 6 semester hours of English composition (Engl 9 o
10 and 11 or 12, or the equivalent), 3 semester hours of social science (genera
psychology is recommended), and 3 semester hours of humanities.

***Core Curriculum (required courses).*** Rad 43, 44, 55, 56, 57, 59, 65, 66, 7
75, 81, 82, 93, 94, 98. For off-campus military students, this requirement is
fulfilled by successful completion of Nuclear Medicine Technology Schoo
(NEC 8416).

### *Applications*

Application forms for the on-campus program are available from the Radio
logic Allied Health Programs Office, 2300 I Street, N.W., Washington, D.C
20037. The deadline for return of completed applications is March 1.

## Prehospital Clinical Medicine Program

The program of study leads to the degree of Associate in Science with a major
in prehospital clinical medicine.

### *Admission to Degree Candidacy*

General requirements for admission to degree candidacy are stated on page
50–54. In addition, students must submit the following records directly to the
GWU Office of Admissions:

1. Photocopies of scores or certificates from national registry examina
tions or certifying boards (where applicable).
2. Verification of satisfactory completion of prehospital clinical training
and proof of current participation in an emergency medical service
system (where applicable).
3. Two letters of recommendation from previous instructors, advisors, o
employers involved in emergency medical services.

A personal interview may be required. Students admitted to the program
must submit, before the first day of class, a letter from a physician attesting to
their good health. The letter should include the results of testing for tubercu
sis and a statement of current immunization status. Applicants who do not
meet the academic requirements for admission to degree candidacy may
reapply after satisfactory completion of a 15-semester-hour probationary
period completed in residence at the George Washington University School of
Medicine and Health Sciences.

### *Advanced Standing*

General provisions for advanced standing are listed on pages 53–54. Advanced
standing may be granted for satisfactory completion of certificate-level course
work in prehospital emergency care, after the candidate submits official
transcripts or records from an accredited, certificate-granting medical facility.
Advanced standing may also be earned for special departmental examinations
passed at specified levels. A $50 fee will be charged for each special departmen
tal examination.

### Degree Requirements

The program requires satisfactory completion of a minimum of 60 semester hours of course work, distributed as follows:

***Human Competence.*** 18 semester hours, including 6 hours of English (Engl 9 or 10 and 11 or 12), 3 hours of psychology or sociology, BAd 110, Educ 180, and Stat 51.

***Core Curriculum (required courses).*** EMed 10, 18, 61, 62, 65, 66, and 6 hours of program electives.

### Applications

Application forms are available from the Director, Emergency Medical Services Degree Programs, 2140 Pennsylvania Avenue, N.W., Washington, D.C. 20037. The deadline for return of completed applications is July 30.

## Radiation Therapy Technology Program

The program of study leads to the degree of Associate in Science with a major in radiation therapy technology.

### Admission to Degree Candidacy

General requirements for admission to degree candidacy are stated on pages 50–54. Applicants must be 18 years of age by the time they first register in the program. Two letters of recommendation must be sent directly from previous instructors, advisors, or employers. The selection process includes a personal interview for qualified applicants. Enrollment is limited. Applicants who do not meet the standard requirements may be considered for admission to degree candidacy upon satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University, with a minimum QPI of 2.5.

### Degree Requirements

Satisfactory completion of at least 61 semester hours of course work is required for the Associate in Science degree, distributed as follows:

***Human Competence.*** 6 semester hours of English composition (Engl 9 or 10 and 11 or 12, or the equivalent).

***Core Curriculum (required courses).*** Anat 115; HCS 116; Phyl 111; Rad 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 23 (9 hours), 25, 33, 130, 190.

### Applications

Application forms are available from the Radiologic Allied Health Programs Office, 2300 I Street, N.W., Washington, D.C. 20037. The deadline for return of completed applications is April 1.

## Radiologic Technology Program

The program of study leading to the degree of Associate in Science with a major in radiologic technology is offered only to off-campus military students.

### *Admission to Degree Candidacy*

General requirements for admission to degree candidacy are stated on pag
50–54. Students who do not meet the standard requirements may be cons
ered for admission to degree candidacy after satisfactory completion o
probationary period of 15 semester hours of course work taken in residence
GWU, with a minimum QPI of 2.5, or upon completion of 15 semester hours
acceptable (2.5) and transferable course work.

### *Degree Requirements*

The program requires satisfactory completion of 62 semester hours of cours
work, distributed as follows:

***Human Competence.*** 6 semester hours of English composition (Engl 9
10 and 11 or 12, or the equivalent), 3 semester hours of social science, and
semester hours of humanities.

***Core Curriculum (required courses).*** Rad 40, 41, 42, 50, 51, 60, 61, 62,
71, 80, 90, 95, 96, 97, 99, 100. This requirement is fulfilled by successful
completion of Radiologic Technology School (NEC 8452).

## Programs Leading to the Bachelor of Science in Health Science

The Bachelor of Science in Health Science degree programs are offered only to
off-campus military students.

### Advanced Hospital Corps School Program

Degree requirements are as follows:

***Human Competence.*** 30 semester hours, including 6 hours in Engl
composition, 3 hours in general psychology, and 21 hours in the humanities
and social sciences.

***Subject Competence.*** 18 semester hours, including HCS 10, 15, and 16 and
an additional 7 hours selected from the following areas: biological and physical
sciences, mathematics, computer science, hospital administration, industrial
hygiene, public health organization and administration, and environmental
science. This requirement is fulfilled by successful completion of Advanced
Hospital Corps School (NEC 8425).

***Vocational Competence.*** 72 semester hours, consisting of HCS 22, 54, 67,
68, 75, 83, 87, 92, 93, 96, 102, 126, 133, 175, and 180 (a corresponding number
of credits for approved course work in the area of subject competence may be
substituted for HCS 175 and 180).

### Nuclear Undersea Medical Technology Program

Degree requirements are as follows:

***Human Competence.*** 30 semester hours, including 6 hours in English
composition (Engl 9 or 10 and 11 or 12), 3 hours in general psychology, and 21
hours in humanities and social sciences.

***Subject Competence.*** 15 semester hours, consisting of HCS 15, 16, 20, and
21. This requirement is fulfilled by successful completion of NEC 8402.

***Vocational Competence.*** 77 semester hours, including HCS 26, 66, 90, 93, 96, and 133 (this requirement is fulfilled by successful completion of NEC 8402) and an additional 9 hours in biological sciences, chemistry, computer science, emergency medical technology, environmental studies, geology, health science, industrial hygiene, physics, public health, or statistics.

## Programs Leading to the Bachelor of Science

Satisfactory completion of a minimum of 120 semester hours of course work is required for the Bachelor of Science degree; some programs, however, may set requirements above the minimum. See individual program descriptions for information on course distribution.

### *Scholarship Requirements*

A minimum cumulative QPI of 2.0 is required for course work in programs leading to the Bachelor of Science degree. A minimum cumulative QPI of 2.5 is required in core-curriculum courses. A student whose QPI in the core curriculum falls below 2.5 in any one semester will receive a warning letter.

## Emergency Medical Services Program

This program is designed for individuals interested in emergency medical services and emergency management. The program includes course work in the liberal arts, education, management, and occupational health and safety. In addition, the department offers the courses students must have to be eligible to take the National Registry Intermediate Paramedic and Paramedic examination.

### *Admission to Degree Candidacy*

The general requirements for admission to degree candidacy are stated on pages 50–54. In addition, students applying to the program must submit the following records directly to the GWU Office of Admissions:

1. Verification of satisfactory completion of prehospital clinical training and proof of current participation in an emergency medical services system (where applicable).
2. Photocopies of scores or certificates from national registry examinations or certifying board examinations (where applicable).
3. Two letters of recommendation, sent directly to the Office of Admissions by instructors familiar with the applicant's academic preparation or colleagues familiar with the applicant's health care experience.

A personal interview may be required. Students admitted to the program must submit, before the first day of class, a letter from a physician attesting to their good health. The letter should include the results of testing for tuberculosis and a statement of current immunization status.

### *Advanced Standing*

General provisions for advanced standing are listed on pages 53–54. In addition, students may receive up to 60 semester hours of advanced standing for satisfactory completion of required course work at other accredited aca-

demic institutions. The program director reserves the right to refuse transf
credit in part or in whole.

### Degree Requirements

The program requires satisfactory completion of a minimum of 120 semeste
hours of course work, distributed as follows:

***Human Competence.*** A minimum of 27 semester hours, including Englis
composition, statistics, accountancy, psychology, sociology, business admini
tration, personnel management, and computer science.

***Subject Competence.*** 39 semester hours, including EMed 10, 18, 20, 3
40, 50, 55, 140, and 200.

***Vocational Competence.*** 54 semester hours, including 34 to 36 hours i
one of the following areas of concentration: education, management, safety an
occupational health, or clinical medicine. The remaining 18 to 20 hours may b
satisfied by electives in emergency medicine or other disciplines.

### Residence Requirement

A minimum of 60 semester hours of course work in the major must be
satisfactorily completed in residence at the School of Medicine and Health
Sciences.

### Applications

Application forms are available from the Director, Emergency Medical Se
vices Degree Programs, 2140 Pennsylvania Avenue, N.W., Washington, D.C.
20037, and should be completed and returned no later than July 30.

## Medical Record Administration Program

The program is designed for accredited record technicians, medical record
technicians, and individuals completing medical record science courses at the
technical level who wish to become medical record administrators. The
program provides an opportunity for graduates of the American Medical
Record Association (AMRA) Independent Study Program or the Correspon
dence Course to receive academic credit for the medical record technology
courses they have successfully completed.

The medical record administration program has been developed in compli
ance with the *Essentials and Guidelines of an Accredited Educational Program
for the Medical Record Administrator* as approved by the AMRA Council on
Education. The program will be reviewed for accreditation by the Committee
on Allied Health Education and Accreditation (CAHEA) of the American
Medical Association in cooperation with the AMRA Council on Education.
When the program is accredited, students will be eligible to take the national
qualifying examination for certification as registered record administrator.

### Admission to Degree Candidacy

The general requirements for admission to degree candidacy are stated on
pages 50–54. In addition, students applying to the program must submit
evidence that they have satisfactorily completed the subject and humani

competence requirements listed under Degree Requirements, below. Two recommendation forms must be sent directly from previous instructors or employers. A personal interview with the program director is required. All applications will be reviewed by the Office of Admissions and the medical record administration program faculty. Students will be advised of their admission status by the Office of Admissions.

### Advanced Standing

General provisions for advanced standing are listed on pages 53–54. In addition, students may receive up to 42 semester hours of advanced standing for completion of anatomy, physiology, pathophysiology, and medical record technology courses (including courses taken in the American Medical Record Association Independent Study Program or Correspondence Course), which may be applied toward fulfillment of the subject competence requirements. Students may also receive a minimum of 42 semester hours of advanced standing applicable toward fulfillment of the human competence requirements, including credit earned at other institutions.

### Degree Requirements

The program requires satisfactory completion of a minimum of 121 semester hours of course work. Students must earn a grade of *C* or better in each of the subject and human competencies and must maintain a minimum cumulative QPI of 2.5 in the major.

***Human Competence.*** A minimum of 42 semester hours, including course work in accountancy, college algebra, data processing, economics, English composition, humanities and social sciences, microbiology, personnel management, principles of management, public speaking, and statistics.

***Subject Competence.*** 42 semester hours, including anatomy, physiology, pathophysiology, and medical record technology courses.

***Vocational Competence.*** 37 semester hours, including AHA 110, 120, 125, 135, 140, 150, 170, 176; HSA 206, 207, 215; Psyc 144.

### Residence Requirement

A minimum of 30 semester hours of course work in the major must be completed in residence at the School of Medicine and Health Sciences.

### Applications

Application forms are available from the Director, Medical Record Administration Program, 2300 I Street, N.W., Washington, D.C. 20037, and should be completed and returned no later than March 1.

## Medical Technology Program

### Admission and Applications

Application forms for admission to the first three years of the program, as outlined under Degree Requirements, below, are available from the Office of Admissions, George Washington University, Washington, D.C. 20052.

Completion of the first three years of the program does not guarante acceptance into the senior (clinical) year conducted at the University Hospita although GWU students are given preference. Students must have ma tained a QPI of 2.0 during the first three years to be considered for admissio to the clinical year. Applicants will also be evaluated on the basis academic achievement in the sciences, personal interviews, and letters recommendation.

Students should apply for admission to the clinical year during their junior year; application is made to the Director, Medical Technology Program 2300 I Street, N.W., Washington, D.C. 20037. Admission interviews take plac between December and March.

## Degree Requirements

The program requires satisfactory completion of 124 semester hours of course work, distributed as outlined below.

| | | Semester Hours |
|---|---|---|
| ***First Three Years*** | | |
| English: | Engl 9 or 10 and 11 or 12 | 6 |
| Humanities: | 6 semester hours selected from one of the following combinations: AmCv 71–72; Art 31–32, 71–72; Chin 163–64; Clas 71, 72, 100, 108, 113; Comm 49, 55, 133, 143, 144; Engl 51–52, 61–62, 71–72; Fren 51–52, 91–92; Ger 51–52, 103–4, 161–62; Hmn 1–2, 3–4; Mus 3–4; Phil 45, 51–52, 71, 111, 112, 113, 131, 132, 151, 152, 162, or 172; Rel 1, 2, 9, 10, 23; Slav 91–92; Span 51-52, 91–92; TrDa 45, 46, 145–46, 151, 152, 153, 190, 191 | 6<br>3<br>15 |
| Mathematics: | Math 30 | 3 |
| Science: | BiSc 11–12, 111; Micr 129 | 4 |
| | 4 semester hours selected from BiSc 104, 127, 128, 145, 148, 155, 163, 164, 165 | 17 |
| | Chem 11–12, 22, 23, 50 | |
| Social Science: | 6 semester hours selected from one of the following combinations: Anth 1, 2, 3; Econ 1–2; Geog 1–2; Hist 39–40, 71–72, Jour 71–72, 111 and 115; PSc 1–2; Psyc 1 and another psychology course; Soc 1–2 or 1 and any 100-level sociology course; SpHr 11 and any 100-level speech and hearing course | 6<br>16<br>15 |
| Electives: | Nonscience electives | 90 |
| | Nonscience or science electives | |

***Senior Year.*** Path 121, 122, 123, 124, 125, 126, 130, 131, 132, 133, Biol 111. The pathology courses in the senior (clinical) year constitute the core curriculum, and students must have a minimum cumulative QPI of 2.5 in these courses in order to graduate. Path 121 is a prerequisite to all other courses in the core curriculum. Students who fail this course will not be allowed to continue in the clinical year. They may, however, apply for readmission to the program and will be subject to the requirements and regulations then in force.

## Residence Requirement

A minimum of 34 semester hours must be completed in residence. This requirement is met through satisfactory completion of the senior year of the program, conducted at the University Hospital.

## Nursing Anesthesia Program

### *Admission to Degree Candidacy*

General requirements for admission are stated on pages 50–54. In addition, an applicant to the nursing anesthesia program must fulfill the following prerequisites to be considered for admission:

1. Have completed successfully high-school or college-level mathematics (general mathematics or algebra) and two semesters of college-level general chemistry (Chemistry 11–12 or equivalent)
2. Be a graduate of a state-approved school of nursing; be a licensed registered nurse in at least one state, U.S. trust territory, or the District of Columbia; and have a minimum of 12 months of practical experience in critical-care nursing
3. Be selected for admission to the school of anesthesia at an affiliated hospital before applying to the program at George Washington University

Students who graduated from nursing school more than five years ago and have not been active in the nursing profession during the last five years may be required to take National League of Nursing or New York State Board of Regents examinations.

### *Advanced Standing*

The general provisions for advanced standing are stated on pages 53–54. In addition, advanced standing will be awarded to students in the nursing anesthesia program as follows:

1. Students who are graduates of two- or three-year nursing school programs and have had a minimum of 12 months of practical experience in critical-care nursing may receive up to 45 hours of credit applicable toward the human and subject competence requirements.
2. Students who have earned a B.S. degree in nursing may receive up to 60 hours of credit applicable toward human and subject competence requirements.
3. Certified Registered Nurse Anesthetists (CRNAs) may petition for advanced standing and waiver of the clinical requirement on the basis of previous anesthesia work experience. They must demonstrate clinical competence before such petitions will be granted.

### *Degree Requirements*

The program requires satisfactory completion of a minimum of 124 semester hours of course work, distributed as follows:

***Human Competence.*** 30 semester hours, including 6 hours in English composition (Engl 9 or 10 and 11 or 12), 3 hours in psychology, and 21 hours in the humanities, social sciences, or mathematics (algebra, geometry, trigonometry, and calculus).

***Subject Competence.*** 30 semester hours of course work in the biological, physical, natural, and nursing sciences.

***Vocational Competence.*** 64 semester hours, consisting of the following.

*Year 1:* Anat 115; Anes 191, 198; Bioc 111; HCS 134; Phar 110–11, 124–25; Phyl 111.

*Year 2:* Anes 193–94, 195–96.

All students must complete Year 1 (the core curriculum) in residence, wi a minimum cumulative QPI of 2.5. CRNAs may petition to waive Year course work on the basis of successful completion of the core curriculu demonstrated clinical competence, and satisfactory completion of an or and/or written examination in the area of clinical anesthesia. The petitio must be submitted to the Assistant Dean, through the program director, f approval.

### *Scholarship Requirements*

Students who do not maintain a cumulative QPI of 2.5 in nursing anesthesi courses taken in the first two semesters may be required to take additiona course work in order to achieve this minimum average.

### *Residence Requirement*

A minimum of 31 semester hours of course work in the major must be completed in residence at the School of Medicine and Health Sciences.

### *Applications*

Application information and forms are available from the Nursing Anesthesia Program, 2300 I Street, N.W., Washington, D.C. 20037. Completed applications must be returned no later than May 15.

## Physician Assistant Program

The program is available to on-campus students and off-campus military students.

### *Admission to Degree Candidacy*

The general requirements for admission to degree candidacy are stated on pages 50–54. In addition, applicants must submit evidence that they have satisfactorily completed a minimum of 30 semester hours of college credit, including two semesters of general chemistry for science majors (biochemistry is recommended), two semesters of psychology (general and abnormal psychology are recommended), and two semesters of biological sciences (recommended courses in the biological sciences include human anatomy and physiology and general microbiology; botany is not acceptable). Direct patient care experience is strongly preferred but not required. Two evaluation forms, submitted directly by the evaluators, and a personal interview are required as part of the admission process (not applicable to off-campus military students).

### *Advanced Standing*

Advanced standing will not be granted toward courses in the major; advanced standing toward the baccalaureate, however, may be awarded for appropriate course work previously completed at other accredited institutions with a minimum grade of *C*.

### *Degree Requirements*

On-campus students must satisfactorily complete the following course work:

***Human Competence.*** 30 semester hours, including 6 hours in English composition (Engl 9 or 10 and 11 or 12) and 24 hours of course work selected from the humanities, social sciences, or mathematics.

***Subject and Vocational Competence.*** 100 semester hours, consisting of the following (courses in the core curriculum are indicated by an asterisk).

*Basic Science Curriculum:* Anat 115; Bioc 111; Micr 128; Path 127, 128, 152; Phyl 111.

*Clinical Sciences:* HCS 109, 125,* 134,* 140, 145, 146, 147, 148, 193; Phar 158 (or 159 and 160).

*Clinical Rotations:* HCS 160,* 163,* 166, 169, 172,* 175,* 178, 198.

*Clinical Electives:* Two clinical electives must be chosen from the following list—HCS 158, 159, 176, 177, 186, 187, 188, 199.

*Other Required Courses:* HCS 113, 116, 119, 137.

*Remedial Courses (if applicable):* HCS 100, 103.

Students must successfully complete all courses for which they have registered in any one semester before advancing to the next semester (except students in the second year who have received an *IP* for work in progress). At the discretion of the program director, a student who fails to complete a course satisfactorily may be dismissed from the program. Students whose academic performance falls below average in any course may be required to take additional courses or to complete remedial work before continuing in the program.

## Residence Requirement

Generally, a minimum of 75 semester hours in the preclinical and clinical portions of the major must be completed in residence at the School of Medicine and Health Sciences. Under special circumstances, exceptions to the minimum residence requirement may be allowed.

## Applications

Application forms for the on-campus program are available from the Physician Assistant Program, Himmelfarb 307, 2300 I Street, N.W., Washington, D.C. 20037, beginning in July. A part-time option is available for students who must work full time. Interested applicants should contact the program director.

## Off-Campus Military Program

Military students in the off-campus program must complete the following courses:

***Human Competence.*** 30 semester hours, including 6 hours in English composition and 24 hours in the humanities and social sciences.

***Subject and Vocational Competence.*** 92 semester hours, consisting of the following (courses in the core curriculum are indicated by an asterisk).

*Basic Health Sciences:* HCS 111, 120, 121, 151.*

*Basic Clinical Sciences:* HCS 109, 127,* 128,* 129,* 134,* 137, 146, 147, 148.

*Clinical Clerkships:* HCS 167,* 169, 172,* 174,* 189, 190, 191, 192, 195, 198.

*Other Required Courses:* A minimum of 30 semester hours of didactic course work must be completed in the biological and physical sciences. This requirement will be satisfied by successful completion of Advanced Hospital Corps School (NEC 8425) or comparable course work.

## Radiologic Sciences and Administration Program

This program is designed for registered technologists in diagnostic radiology technology, nuclear medicine technology, ultrasound, or radiation therapy technology who wish to continue their education at the baccalaureate level.

### *Admission to Degree Candidacy*

The general requirements for admission to degree candidacy are stated on pages 50–54. In addition, students applying to the program must be registered technologists or registry-eligible within the first academic semester. Two letters of recommendation (submitted directly by previous instructors, advisors, or employers) and a personal interview are required.

### *Advanced Standing*

General provisions for advanced standing are listed on pages 53–54. In addition, students may receive up to 48 semester hours of credit applicable toward fulfillment of the subject competence requirements under the following conditions:

1. If their technical training was completed within the last five years. Such students, however, must have maintained a minimum QPI of 2.5 or an average of 80% in a program in radiologic technology, nuclear medicine technology, or radiation therapy accredited by the Joint Review Committee on Educational Programs in Radiologic Technology, Nuclear Medicine Technology, or Radiation Therapy of the Council on Medical Education of the American Medical Association.
2. If they have been certified as an American Registered Technologist, Nuclear Medicine Technologist, or Radiation Therapy Technologist.
3. If they become registry-eligible during the first academic semester at George Washington University.

### *Degree Requirements*

The program requires satisfactory completion of 124 semester hours of course work, distributed as follows:

***Human Competence.*** A minimum of 30 semester hours, including BAd 110 and 191, CpMd 101, Engl 9 or 10 and 11 or 12, Psyc 1, 6 hours of social sciences, and 6 hours of humanities. Recommended electives include Comm 111, Engl 101, Psyc 144, and Soc 124 and 129.

***Subject and Vocational Competence.*** A total of 94 semester hours is required. Of these, a maximum of 48 semester hours is allowed for course work in an American Medical Association approved program in either diagnostic radiologic technology, nuclear medicine technology, or radiation therapy technology. The remaining 46 semester hours consist of the following required courses, which constitute the core curriculum.

*Radiologic Sciences:* Rad 130, 160, 167, 171, 175, 190, 195.
*Radiologic Administration:* HSA 142, 153, 154, 170; Rad 140, 145.
*Electives:* 6 hours selected in consultation with the faculty advisor.

### *Residence Requirement*

A minimum of 30 semester hours of course work in the major must be completed in residence at the School of Medicine and Health Sciences.

### *Applications*

Application forms are available from the Radiologic Allied Health Programs Office 2300 I Street, N.W., Washington, D.C. 20037, and should be completed and returned no later than May 15.

## Certificate Programs

### Certificate in Medical Technology

Students who have already earned the bachelor's degree from an accredited institution and have completed course work comparable to that required in the first three years of the medical technology degree program (see above) may apply for admission to the clinical year. Upon successful completion of this program of study, they will be awarded a certificate in medical technology.

In addition to completing the application for the clinical year, applicants to the certificate program must have copies of all college transcripts sent to the director of the medical technology program. Three letters of recommendation are also required, two from science instructors and one from a faculty advisor or employer.

Applicants who have received their education from a university outside the United States must have their transcripts evaluated by one of the foreign transcript evaluation agencies. A list of acceptable evaluation agencies may be obtained from the program director. A copy of this evaluation should be sent with the other required documents.

### Nurse Practitioner Certificate

#### *Admission Requirements*

To be considered for admission to the nurse practitioner certificate program, an applicant must (1) have a B.S.N. or M.S.N. from an accredited school of nursing, (2) have a grade-point average of 2.5 (out of 4.0) from the B.S.N. or M.S.N. degree program, and (3) have practiced nursing during the two-year period before seeking admission to the program.

Three letters of recommendation must be sent directly from evaluators. At least one must be from a supervisor; the remainder may be submitted by present or former instructors or by colleagues familiar with the applicant's health care experience.

#### *Program Requirements*

Students must successfully complete the following courses to be eligible to take the American Nurses Association's Adult Nurse Practitioner certification examination:

HCS 125, 140, 143, 144, 175, and Phar 158 .

Students must also complete a 450-hour preceptorship that has been individually designed from the following courses:

HCS 153, 154, 157, 165, 170, and 177

In addition, students who wish to take the American Nurses Association's

Gerontologic Nurse Practitioner certification examination may elect th
following courses in gerontology:

HCS 193 and either Gern 201 or Soc 280 and HCS 154 (as part of the 48
hour preceptorship)

The courses for the adult and gerontologic nurse practitioner certificate ma
be taken on a full-time or part-time basis.

### *Applications*

Application materials are available from and should be returned to the Nurs
Practitioner Program, Himmelfarb 303, 2300 I Street, N.W., Washington, D.C.
20037. The program sequence begins in January.

## Physician Assistant Certificate Program

The post-baccalaureate program leading to the physician assistant certificate
is available only to those students who are also pursuing the Master of Public
Health degree (see page 42). To be considered for admission to this component
of the joint Physician Assistant–M.P.H. program, applicants must have a
bachelor's degree from an accredited college or university and must meet the
requirements for admission to degree candidacy in the physician assistant
program (see above). The program of studies for the certificate consists of those
courses needed to fulfill the subject and vocational competence requirements of
the degree program. Application forms for the joint program are available from
the M.P.H. Admissions Office, GWU School of Medicine and Health Sciences,
Box 32, 2300 I Street, N.W., Washington, D.C. 20037.

## Certificate in Radiation Therapy Technology

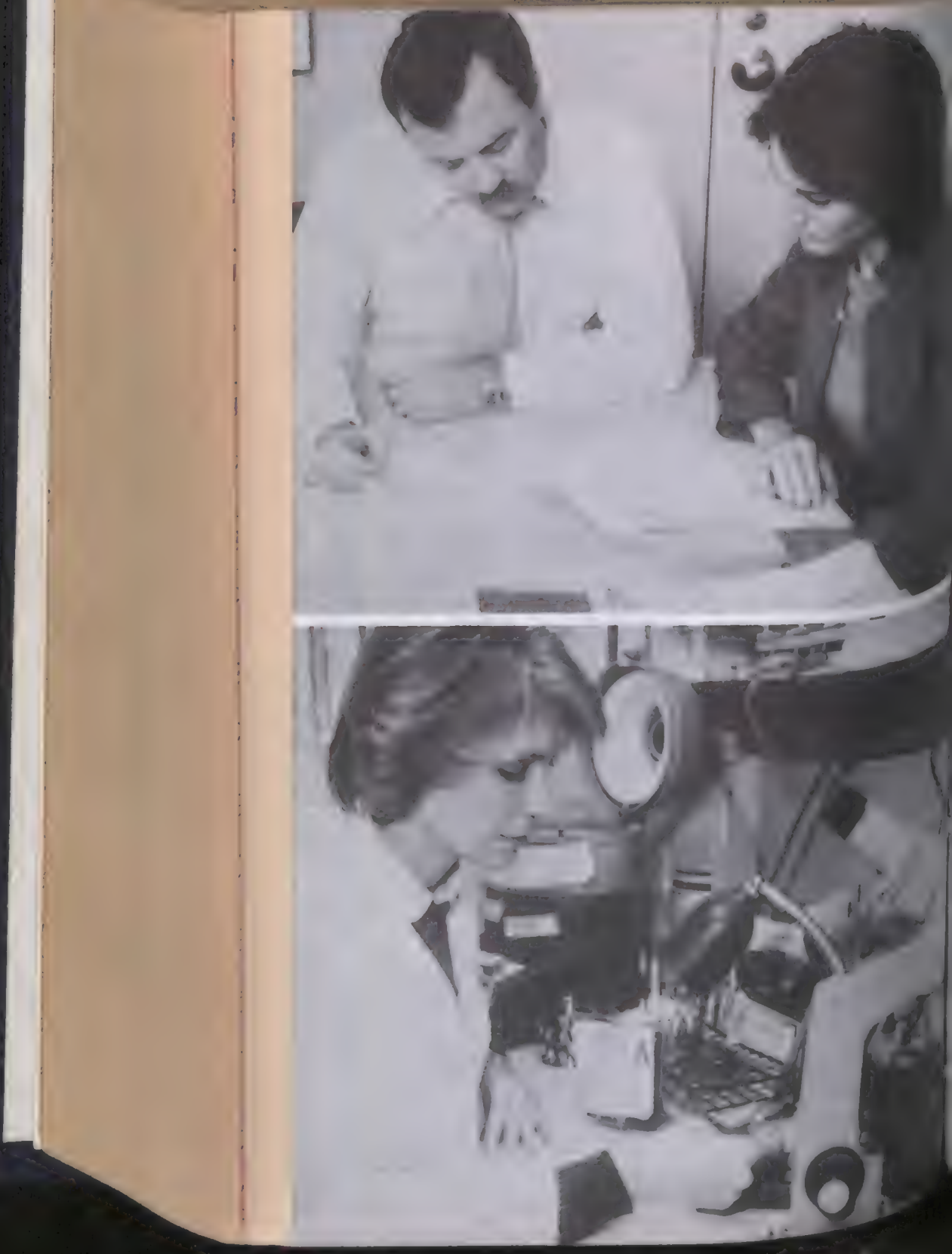
Admission to the certificate program in radiation therapy technology is open to
ARRT-registered or registry-eligible graduates of an accredited radiation
technology program. Nurses and other allied health professionals are also
eligible for admission if they have taken relevant physics courses prior to
application. The program requires satisfactory completion of at least 30
semester hours of course work, including Rad 11, 12, 16, 17, 18, 19, 20, 21, 23
hours), 24, 25, 130, and 190.

Application forms for the certificate program are available from the
Radiologic Allied Health Programs Office, 2300 I Street, N.W., Room 411,
Washington, D.C. 20037. The deadline for return of completed applications is
April 1.

# Courses Offered by Other Divisions of the University

Students should consult their academic advisors for information about re
quired courses that are offered by Columbian College of Arts and Sciences or
by the School of Government and Business Administration. The program
coordinators in the Office of Health Sciences Programs Administration will
provide assistance in choosing electives appropriate for the student's program.
These may be selected from a range of offerings in the humanities, mathemat
ics, and social sciences; see the University's *Undergraduate and Graduate*
*Programs Bulletin* for complete course descriptions.

Off-campus students should consult the appropriate program coordinator
for assistance in selecting electives and required courses at other institutions.



# Courses of Instruction

Courses are subject to change. The University reserves the right to withdraw any course announced. The staff of instruction listed by department at the back of this *Bulletin* is current as of January 1988.

## *Explanation of Course Numbers and Symbols*

Courses numbered 1–200 are for students in undergraduate health sciences programs. Courses in the basic science departments numbered 201–400 are for candidates for the M.D. degree and for students in the Graduate School of Arts and Sciences. All other courses numbered from 201 to the 800s are primarily for candidates for the M.D. degree unless otherwise stated.

A number in parentheses after the name of the course indicates the number of semester hours of credit that may be earned. Five semester hours of credit per four-week elective period are granted for all fourth-year courses in the M.D. program.

## *Key to Abbreviations*

The following abbreviations are used for course designations.

| | |
|---|---|
| Accy | Accountancy |
| AdSc | Administrative Sciences |
| AHA | Allied Health Administration |
| AM | Association Management |
| AmCv | American Civilization |
| Anat | Anatomy |
| Anes | Anesthesiology |
| Anth | Anthropology |
| ApSc | Applied Science |
| Art | Art |
| ArTh | Art Therapy |
| BAd | Business Administration |
| Bioc | Biochemistry |
| BiSc | Biological Sciences |
| Cart | Cartography |
| CE | Civil Engineering |
| CH&D | Child Health and Development |
| Chem | Chemistry |
| Chin | Chinese |
| Clas | Classics |
| ClEn | Clinical Engineering |
| Cnsl | Counseling |
| Comm | Communication |
| CpMd | Computer Medicine |
| CSci | Computer Science |
| Derm | Dermatology |
| EAd | Engineering Administration |
| Econ | Economics |
| Educ | Educational Leadership |
| EE | Electrical Engineering |
| EFL | English as a Foreign Language |
| EMed | Emergency Medicine |
| Engl | English |
| EngS | Engineering Science |
| EnHe | Environmental Health |
| Envr | Environmental Studies |
| EPol | Education Policy |
| E&RP | Environmental and Resource Policy |
| ExSA | Exercise and Sport Activities |
| ForS | Forensic Sciences |
| Fren | French |
| Geog | Geography and Regional Science |
| Geol | Geology |
| Ger | Germanic Languages and Literatures |
| Gern | Gerontology |
| Gnet | Genetics |
| HCS | Health Care Sciences |
| Hist | History |
| HmKn | Human Kinetics |
| Hmn | Humanities |
| HmSr | Human Services |
| HRD | Human Resource Development |
| HSA | Health Services Administration |
| IAff | International Affairs |
| Idis | Interdisciplinary Courses |
| Ital | Italian |
| Japn | Japanese |
| Jour | Journalism |
| Kor | Korean |
| Law | Law |

| | |
|---|---|
| Libr | Library |
| Math | Mathematics |
| ME | Mechanical Engineering |
| Med | Medicine |
| Mgt | Management Science |
| Micr | Microbiology |
| MStd | Museum Studies |
| Mus | Music |
| Neur | Neurology |
| NSc | Naval Science |
| NSur | Neurological Surgery |
| Ob&G | Obstetrics and Gynecology |
| Opht | Ophthalmology |
| OR | Operations Research |
| Orth | Orthopaedic Surgery |
| PAd | Public Administration |
| Path | Pathology |
| Pchi | Psychiatry and Behavioral Sciences |
| PCm | Political Communications |
| Phar | Pharmacology |
| Phil | Philosophy |
| Phyl | Physiology |
| Phys | Physics |
| Port | Portuguese |
| PPol | Public Policy |
| PSc | Political Science |
| Psyc | Psychology |
| PubH | Public Health |
| Rad | Radiology |
| Rel | Religion |
| Rmn | Romanian |
| Rom | Romance Literatures |
| Slav | Slavic Languages and Literatures |
| SLP | Service Learning Program |
| Soc | Sociology |
| Span | Spanish |
| SpEd | Special Education |
| SpHr | Speech and Hearing |
| Stat | Statistics/Computer and Information Systems |
| Surg | Surgery |
| TCom | Telecommunications Policy |
| TrDa | Theatre and Dance |
| TrEd | Teacher Education |
| T&T | Travel and Tourism |
| Univ | University |
| Urol | Urology |
| U&RP | Urban and Regional Planning |
| WStu | Women's Studies |

## Allied Health Administration

Courses numbered 100–180 (except AHA 110, 125, and 135) are open only to degree candidates in the medical record administration program.

110 **Health Care Organization** (3)
Introduction to the organization of health care delivery in the United States, with emphasis on the structural aspects of resources available to, and problems encountered in, the present health care system. (Fall) Dale

120 **Managing Health Information Services** (3)
Lecture (2 hours), laboratory (2 hours). Introduction to management principles as applied to the planning, development, organization, coordination, and evaluation of information services for health care facilities and related agencies. Dale

125 **Financial Concepts for Health Care Managers** (3)
Introduction to financial and accounting concepts related to health care management. Review of reimbursement and documentation issues. Prerequisite: permission of program director. (Fall) Dale

135 **Quality Assurance for Health Care Managers** (3)
Development, implementation, coordination, and evaluation of quality assurance systems, including utilization management, quality assessment, risk management, and peer review. Prerequisite: permission of program director. Dale

140 **Computer Applications in Health Information Management** (3)
Application of principles introduced in AHA 130 to development, implementation, and evaluation of hardware and software for computer-based health information systems. Prerequisite: AHA 130.

150 **Professional Standards in Health Record Administration** (3) Staff
Study of the standards of professional practice used to evaluate health record management and maintain the integrity of record systems.

170 **Management Practicum in Health Information Systems** (4) Staff
Supervised placement in the medical record department of an accredited health care facility. Includes four-week assignment in one facility and two-week assignment in another.

175 **Health, Education, and Rehabilitation Networks** (3) Staff
Survey of the roles and relationships of selected health care, special education, and rehabilitation services. Topics include philosophical foundations, current legislation, and societal concerns as they relate to the professions.

176 **Seminar: Management of Health Information Systems** (3) Dale
Consideration of topics related to marketing, research, and education. Discussion of clinical experience in health record management.

199 **Independent Study** (3) Staff
Student determines the area of study and develops learning objectives in conjunction with the faculty advisor.

## Anatomy

*Chair:* R. S. Snell

115 **Anatomy for New Health Practitioners** (4) Staff
Gross and microscopic structure of the human body, including musculoskeletal, nervous, endocrine, cardiovascular, respiratory, gastrointestinal, urinary, and reproductive systems. Laboratory work is limited to prosected anatomical demonstrations.

202 **Gross Anatomy** (6) Snell and Staff
For graduate students. Regional dissections of adult cadaver supplemented with lectures and X-rays. Laboratory fee, $30. (Fall)

203 **Human Developmental Anatomy** (1) K. Johnson
For graduate students. Origin and development of human body; emphasis on value of embryology in interpreting anatomical anomalies. (Fall)

204 **Neuroanatomy** (2) T. Johnson
For graduate students. Gross and microscopic anatomy of central nervous system and special senses. Laboratory fee, $13. (Fall)

205 **Human Microscopic Anatomy** (3) Koering and Staff
For graduate students. Microscopic structure of cells, tissues, and organs of the human body. Laboratory fee, $20. (Fall)

208 **Comparative Vertebrate Neurology** (1) T. Johnson
For graduate students. Survey of the evolution of the vertebrate brain. Prerequisite: Anat 204. Laboratory fee, $10. (Spring)

209 **Use of Audiovisual Techniques in Anatomy** (2) Allan
For graduate students. Preparation of a significant audiovisual program about some aspect of human anatomy. Laboratory fee, $20. (Spring)

212 **Neurobiology** (3) Staff
For graduate students. Integrated survey of the structure and function of the human nervous system. Lecture, clinical demonstration, and laboratory. Same as Idia/Phyl 212. Laboratory fee, $25.

213 **Gross Anatomy** (6) Staff
Required for medical students. (Fall)

214 **Microscopic Anatomy** (3) Staff
Required for medical students. (Fall)

215 **Human Developmental Anatomy** (1) Staff
Required for medical students. (Fall)

221–22 **Seminar** (1–1) Snell
For graduate students. Research reports and discussions of special topics by guest lecturers, staff, and students. Medical students encouraged to attend. (Academic year)

249 **Introduction to Anatomical Research** (1) Staff
For graduate students. Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)

252 **Physical Anthropology** (1) Ubelaker
Variations in humans and factors affecting them, human evolution and racial differences, anatomy and culture of ancient humans. (Spring)

253 **Brain-Tissue Interactions** (1) Walsh and Rosenstein
Interactions of the central nervous system with the muscular, sensory, and endocrine systems. Student presentations and clinical aspects. Prerequisite: Anat/Idis/Phyl 212. (Spring)

254 **Fetal Anatomy** (2) Allan
Dissection of midgestational fetus. Comparison of fetal and adult structures. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

260 **Electron Microscopy in Cellular Biology—Lecture** (1) Koering
Introduction to the morphology of the cell and its relationship to electron microscopic techniques. (Spring)

261 **Electron Microscopy in Cellular Biology—Laboratory** (4) Koering
Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration: Anat 260. Laboratory fee, $25. (Spring)

262 **Gross Anatomy of the Upper and Lower Extremities** (2) Snell and Staff
Detailed dissection, supplemented by X-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

264 **Gross Anatomy of Head and Neck** (2) Snell
Detailed dissection, supplemented by X-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

265 **Clinical Cell Biology and Electron Microscopy** (arr.) Albert
Investigation of clinical problems concerning microwave effects on the nervous system. Four-week elective periods.

266 **Gross Anatomy of Thorax and Abdomen** (2) Snell
Detailed dissection, supplemented by X-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

268 **Gross Anatomy of Pelvis, Perineum, and Lower Extremity** (2) Snell and Staff
Detailed dissection, supplemented by X-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

270 **Dissection of the Human Brain** (1) T. Johnson
Dissection of major pathways and nuclei of the brain with consideration of ventricular system; conferences and assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

272 **Autonomic Nervous System** (1) Allan
Development, microscopic and gross anatomy, and function of central and peripheral components of autonomic nervous system. (Spring)

275 **Advanced Human Embryology** (2) Allan
Microscopic examination of the human embryo at several critical periods during embryogenesis. Limited enrollment. (Spring)

276 **Advanced Studies in Anatomy** (1) Staff
Lectures and conferences on selected anatomical subspecialties—endocrinology, teratology, growth, and others. May be repeated for credit. (Spring)

279 **Applied Regional Anatomy** (arr.) Snell
Regional dissection, assigned reading, discussions. (Spring)

282 **Advanced Neuroanatomy** (arr.) T. Johnson and Staff
Dissection of the human brain, study of slides of the central nervous system, introduction to neurological research.

284 **Applied Surface Anatomy and Radiology** (5) Snell
Detailed study of anatomical structures that are accessible to examination in the living subject; normal radiology of the body. Four-week elective periods. (Spring)

288 **Surface Anatomy and Radiology** (1) Snell
Lectures and demonstrations on areas of clinical importance. (Spring)

289 **Biochemical and Morphological Techniques in Cell Biology** (3) Slaby
Application of biochemical and electron micrographic techniques used in cell biology research. Limited enrollment.

291 **Special Projects in Anatomy** (arr.) Snell
Independent study of any aspect of gross anatomy.

295 **Research** (arr.) Staff
Content differs each time course is offered; may be repeated once for credit. Fee to be arranged. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

501 **Didactic Anatomy** (3) Snell
Development of a didactic program to include human developmental anatomy, microscopic anatomy, gross anatomy, and where appropriate, neuroanatomy. May also include interdepartmental study. Topics may include anatomy of the special senses; functional morphology of the endocrine system; structure and functional anatomy of the mammary gland at different ages in both sexes; functional anatomy of the respiratory system, including a study of the bronchopulmonary segments; the urinary system; the heart; the autonomic nervous system; the lymphatic system; the female or male reproductive system; peripheral nerves and peripheral nerve lesions; functional anatomy of bones and joints; the pregnant uterus; the structural and functional anatomy of the stomach, duodenum, and colon.

800 **Summer Remedial: Gross Anatomy** (6) Snell

801 **Summer Remedial: Microscopic Anatomy** (3) Snell

802 **Summer Remedial: Human Developmental Anatomy** (1) Snell

## Anesthesiology

*Chair:* B. S. Epstein

Courses numbered 190–198 are open only to degree candidates in the nursing anesthesia program.

190 **Seminar: Anesthesiology** (4) Staff
Discussion of morbidity and mortality based on actual and reported cases. Topics related to complications of anesthesia.

191 **Respiratory Care** (3) Staff
Advanced techniques for the care of patients requiring total respiratory support. Same as Phar 191.

192 **Orientation for Anesthesia** (0) Staff
History of anesthesia, legal aspects, ethics, psychology, professional conduct, department management, organization.

193–94 **Methods and Procedures in Anesthesia** (2–2) Staff
At affiliated hospitals. Anesthesia techniques, types of anesthetic required to meet the needs of different surgical specialties, and related topics.

195–96 **Principles of Clinical Anesthesia** (13–13) Staff
Twelve-month course at affiliated hospitals. Supervised clinical training and experience. The student is assigned patients, organizes and administers anesthesia, and follows patients throughout hospitalization. Designed to satisfy the requirements of the American Association of Nurse Anesthetists.

198 **Pathological Physiology and Anesthesia** (3) Staff
Review of pathophysiology of major organ systems in relation to anesthesia. Clinical implications of various disease states, their interactions with anesthetics, and effects on anesthetic management.

210 **Cardiovascular Research in Anesthesia** (5) Mergner
Experience in and observation of the various aspects of laboratory research in anesthesia, particularly research on regional myocardial ischemia in the dog.

211 **Diagnostic and Therapeutic Instrumentation** (2) Shaffer
Introduction to diagnostic and therapeutic instrumentation used in critical care areas of the hospital, including the OR, ICU, CCU, and ICN. Methods of operation, problems, and new developments in instrumentation.

212 **Anesthesiology Research Laboratory** (2) Mergner
Cardiovascular physiologic changes and measurements resulting from drugs, drug interactions, and anesthetic techniques. Placental transfer and fetal and maternal physiologic changes from toxic local anesthetic reactions. Limited enrollment. Second year only.

302 **Required Anesthesiology** (3) Morales and Staff
Required for senior medical students. Basic physiology and pharmacology as applied to cardiac, respiratory, obstetric, and renal changes incurred during anesthesia. Clinical applications are discussed and demonstrated.

380 **Anesthesiology** (5) Morales
Clinical experience in preoperative evaluation, surgical and obstetrical anesthesia, infant and adult resuscitation, inhalation therapy, and monitoring and blood gas determinations. Four-week elective periods. University Hospital. Lee

382 **Neurosurgical Anesthesia** (arr.)
Principles of clinical management of the neurologic patient in the perioperative period. Physiology and pharmacology of intracranial pressure and cerebral blood flow and metabolism. Monitoring of somatosensory, visual, and auditory evoked responses and intracranial pressure. Effects of respiratory, nursing and physiotherapy maneuvers on neurosurgical patients. Participation in research projects in operating room and intensive care unit may be possible. University Hospital.

384 **Intensive Care Unit** (5) Zimmerman and Staff
Evaluation and management of respiratory failure, rationale and use of ventilators, airway management, cardiovascular support, and intensive care. Four-week elective periods. University Hospital.

386 **Critical Care Medicine** (arr.) Rainey and Staff
Experience in managing patients with renal failure, shock, respiratory

failure, acid–base disorders, and hyperalimentation, with emphasis on appropriate use of invasive monitoring, intubation, and ventilatory support.

387 **Critical Care Medicine Research** (arr.) Rainey
Investigation of pathophysiologic mechanisms involved in the metabolic and cardiopulmonary alterations of critical illness that may lead to development of new pharmacologic agents useful in treating critically ill patients. May include clinical research, animal research, or bench laboratory investigation. National Naval Medical Center.

390–92 **Extramural Anesthesiology Elective** (arr.)
Elective periods at other institutions.

## Biochemistry

*Chair:* A. L. Goldstein

101 **Chemistry for Allied Health Science** (2) Staff
For students in health sciences programs. Basic concepts of general and organic chemistry. (Fall)

111 **Biochemistry for Allied Health Science** (4) Walker
For students in health sciences programs. Basic concepts of biochemistry and their relation to the allied health field. (Fall)

201 **Medical Biochemistry** (8) Walker and Staff
Required for medical students. Lecture and laboratory; emphasis on basic principles and their relation to medicine. (Fall)

209 **Research Elective in Medical Biochemistry** (arr.) Walker
For senior medical students. Research in areas currently under investigation in the department. (Academic year)

221–22 **General Biochemistry** (4–4) Gallo and Staff
A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Prerequisite: Chem 152, 154. (Academic year)

223 **Physical Biochemistry** (3) Vanderhoek
Lectures cover basic laboratory techniques used in contemporary biochemical and molecular biological research. (Fall)

225–26 **Introduction to Biochemical Research** (arr.) Fiskum and Staff
Rotation through research projects in laboratory units within the biochemistry department to provide individualized in-depth training in the methods and instrumentation used. Limited to graduate students in the department. (Academic year)

227 **Biochemistry Seminar** (1) Staff
Current literature in biochemistry. Enrollment limited to graduate students in the department. May be repeated for credit. (Fall and spring)

230 **Current Topics in Enzymology** (2) Bailey and Staff
Directed readings in various areas of enzymology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 229.

231 **Bioenergetics** (2) Staff
Biochemical thermodynamics, oxidation–reduction processes, oxidative phosphorylation, photosynthesis, and chemiosmotic energy coupling. Prerequisite: Bioc 201 or 221–22. (Fall)

240 **Nutrition** (2) Walker and Staff
Discussion of RDA, nitrogen balance, vitamins and minerals, diets, and other special topics. Prerequisite: Bioc 201 or 221–22. (Spring)

**260 Biochemistry of Lipids and Membranes** (2) Vanderbo
For graduate students. Biochemistry, structures, and function of various lip classes, membranes, and receptors. Prerequisite: Bioc 221–22. (Spring)

**261 Current Topics in Lipids** (1 or 2) St
Directed readings in the area of lipid biochemistry. May be repeated f credit. Enrollment limited to graduate students in biochemistry. Prereq site: Bioc 260.

**264 Membrane-Associated Complex Lipids** (1) Fishma
Catabolism and biosynthesis of complex sphingolipids, inherited metabol diseases associated with abnormal sphingolipid metabolism, membrane r ceptors for toxins and hormones, and other special topics. Prerequisite: Bi 221–22. (Spring)

**270 Biochemistry and Cell Biology of the Immune Response** (2) Naylor and Sta
Biochemical aspects of the immune response at the molecular and cellular level Modern experimental approaches to immunology and cell biology. Prerequisite Bioc 221–22 and Micr 229, or permission of instructor. (Spring)

**271 Current Topics in Immunology** (1 or 2) Goldstein and Staf
Directed readings in the area of biochemical immunology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequ site: Bioc 270.

**280 Neurochemistry** (2) Moody and Staf
Molecular structure and function of nerve tissue, intra- and interneuronal communication mechanisms, biochemistry of various brain dysfunctions, and other special topics. Prerequisite: Bioc 201 or 221–22. (Fall)

**290–91 Extramural Biochemistry Elective** (arr.) Staf
Elective periods at other institutions.

**295 Research in Biochemistry** (arr.)
Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Content differs each time course is offered. May be repeated for credit. (Fall and spring) Staf

**299–300 Thesis Research** (3–3) Staf
(Fall and spring)

**398 Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring) Staf

**399 Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring) Walker

**501 Readings in Human Nutrition** (arr.)
For senior medical students. Directed readings in human nutrition. Review of basic concepts of nutrition and their application to clinical situations. (Spring) Goldstein

**503 Readings in Immunology** (3)
Directed readings in immunochemistry, immunobiology, tumor immunology, and basic and clinical cellular immunology. May be repeated for credit. (Spring)

**800 Summer Remedial: Biochemistry** (8)

## Child Health and Development

***Acting Chair:*** L. P. Scott
***Directors of Divisions:*** L. J. D'Angelo *(Adolescent Medicine)*, R. M. Sly

*lergy)*, R. S. Chandra *(Anatomical Pathology)*, W. A. McGill II *(Anesthesiology)*, R. N. Ruckman *(Cardiology)*, F. M. Midgley *(Cardiovascular Surgery)*, J. M. Hicks *(Clinical Laboratories)*, P. R. Holbrook *(Critical Care)*, D. Forrester *(Dentistry)*, M. L. Elgart *(Dermatology)*, W. Hung *(Endocrinology)*, B. Kerzner *(Gastroenterology)*, K. N. Rosenbaum *(Genetics)*, G. G. Herer *(Hearing and Speech)*, S. L. Leikin *(Hematology)*, W. J. Rodriguez *(Infectious Diseases)*, G. B. Avery *(Neonatology)*, E. J. Ruley *(Nephrology)*, S. A. Shelburne, Jr. *(Neurology)*, D. C. McCullough *(Neurosurgery)*, D. S. Friendly *(Ophthalmology)*, D. W. McKay *(Orthopaedic Surgery)*, K. M. Grundfast *(Otolaryngology)*, A. H. Einhorn *(Pediatric Medicine)*, G. Eng *(Physical Medicine)*, M. J. Boyajian *(Plastic Surgery)*, J. H. Egan *(Psychiatry)*, K. C. Wells *(Psychology)*, R. J. Funk *(Pulmonary Medicine)*, W. J. McSweeney *(Radiology)*, P. H. White *(Rheumatology)*, J. G. Randolph *(General Surgery)*, A. B. Belman *(Urology)*

303 **Pediatric Clerkship** (10) Greenberg
Required for medical students. Full-time experience as part of resident team. Ward rounds, work in outpatient department and specialty clinics under staff supervision, lectures, clinical conferences, grand rounds. Includes child psychiatry and child guidance. Eight-week periods throughout the academic year. Children's Hospital.

360 **Clinical Pediatrics Acting Internship: Adolescent Unit** (5) Einhorn
Four-week elective periods. Children's Hospital.

361 **Clinical Pediatrics Acting Internship: Infectious Diseases** (5) Einhorn
Four-week elective periods. Children's Hospital.

362 **Clinical Pediatrics Acting Internship: General Medicine** (5) Einhorn
Children aged 2 months to 3 years. Four-week elective periods. Children's Hospital.

363 **Clinical Pediatrics Acting Internship: General Pediatrics** (5) Einhorn
Children aged 3 to 12 years. Four-week elective periods. Children's Hospital.

365 **Clinical Pediatrics Acting Internship: General Pediatrics** (5) Van Brakle
Ward and ambulatory services. Lectures, conferences, rounds. Four-week elective periods. Holy Cross Hospital.

366 **Mental Retardation** (arr.) Battle
Review of etiologic factors, clinical manifestations, seizures, disorders, therapeutic and preventive aspects, sociological problems, and restorative and rehabilitative approaches to chronic disease/disorder. Experience in a medical care delivery program and three educational programs for the retarded. Hospital for Sick Children.

373 **Pediatric Urology** (arr.) Belman
Experience in treatment of inpatients and outpatients, including assessment, diagnostic evaluation, and surgery. Four-week elective periods. Children's Hospital.

374 **Pediatric Orthopaedic Surgery** (5) Nason
Four-week elective periods. Children's Hospital.

375 **Pediatric Surgery** (arr.) Randolph and Staff
Supervised participation in surgical service for infants and children, including newborn surgery and surgery for trauma and neoplasms. Children's Hospital.

376 **Pediatric Neurology** (5) Gale
Inpatient and outpatient management of children with a variety of neurologic disorders. Experience in the gamut of diagnostic procedures. Participation in regularly scheduled clinical rounds, conferences, and seminars is encouraged. Children's Hospital.

378 **Genetics** (5) Rosenbaum
Principles of basic human genetics, with emphasis on the dysmorphic child, chromosomal aberrations, and genetic counseling. Opportunity to work in the genetic laboratory and to learn chromosomal techniques. Four-week elective periods. Children's Hospital.

379 **Pediatric Intensive Care** (arr.) Holbrook, Fields, Pollack
Pathophysiology and treatment of life-threatening illnesses, conditions, or injuries in childhood. Supervised patient responsibility. Children's Hospital.

380 **Development Disabilities** (arr.) Battle
Theoretical issues of development, clinical appraisal, and intervention strategies for disability in vision, audition, motor functions, cognition, language, feeling, and affective development. Includes review of normal development in all areas. Weekly reading assignments, written projects, and discussion sessions. Hospital for Sick Children.

381 **Pediatric Allergy and Immunology** (5) Sly, Josephs, Slater
Introduction to pediatric allergy and clinical immunology; clinics and ward. Some experience in experimental techniques, pulmonary function testing, and objective methods of clinical evaluation. Children's Hospital.

382 **Pediatric Radiology** (arr.) McSweeney and Staff
Participation in conferences and observation in the department. Conventional and newer nonconventional body-imaging techniques are stressed. Children's Hospital.

383 **Pulmonary Medicine** (arr.) Fink
Introduction to SIDS and sleep apnea program, pulmonary function testing, and fiber-optic bronchoscopy. Diagnostic and therapeutic procedures. Pulmonary and nutritional manifestations and complications in cystic fibrosis patients, from newborns to those in their third decade. Medical, surgical, psychological, and social problems of cystic fibrosis patients and their families. Children's Hospital.

386 **Pediatric Hematology/Oncology** (5) Leiken and Staff
Clinical course on the diagnosis and management of children with hematologic and oncologic diseases. Laboratory experience, including examination of peripheral blood smears and bone marrow aspirates and interpretation of laboratory tests. Four-week elective periods. Children's Hospital. Battle

387 **The Chronically Ill Child and Family in the Community** (arr.)
Emphasis on care provided children with chronic illnesses in the hospital and in the community. Introduction to the health team concept and preparation to serve as part of an interdisciplinary health care team. Contact with nurses, allied health professionals, and other team members. Focus on the biosocial aspects of care and on improving the functioning of children with chronic illness, rather than on specific diseases. Hospital for Sick Children.

388 **Newborn Medicine** (arr.) Avery and Staff
Observation and experience in the intensive care of infants. Four-week elective periods. Children's Hospital.

389 **Pediatric Cardiology** (5) Perry and Staff
Physical diagnosis of congenital and acquired heart diseases, interpretation of electrocardiograms and vectorcardiograms, cardiac catheterizations. Four-week elective periods. Children's Hospital.

390–95 **Extramural Pediatric Elective** (arr.)
Elective periods at other institutions.

396 **Approach to Care of Child with Handicapping Conditions** (arr.) Battle
Multidisciplinary approach to care of children with multiple handicaps, developmental delay, and/or chronic illness, in clinical assessments, therapy sessions, and interdisciplinary conferences. Reaction and behavior of the child, family, and staff are explored. Weekly reading assignment, written projects, and discussion sessions. Hospital for Sick Children.

397 **Pediatric Nephrology** (arr.) Bock and Staff
Emphasis on clinical pediatric nephrology of inpatients and outpatients. Opportunities for evaluation of new referrals for renal problems and the management of known renal disease in children. Research opportunities are available in immunologic causes of renal disease, complement abnormalities, vitamin D metabolism, acid–base physiology, and renal physiology, but clinical aspects of the program are stressed. Children's Hospital.

399 **Ambulatory Adolescent Medicine** (5) Silber and Staff
Outpatient clinic experience in diagnosis and management of adolescent problems, under supervision of senior staff and fellows. Participation in consultative clinics, multidisciplinary interviewing conferences, medical teaching conferences, adolescent grand rounds, and twice-weekly conferences with director of outpatient management and department chair. Children's Hospital.

400 **Pediatric Laboratory Medicine** (arr.) Campos and Staff
Laboratory studies of infants and children correlated with clinical disease. In-depth review of laboratory diagnostic studies. Four-week elective periods. Children's Hospital.

401 **Pediatric Otolaryngology** (5) Milmoe and Staff
Otoscopic examination of infants and children. Management of common middle-ear disorders. Evaluation of stridor and airway compromise. Children's Hospital.

403 **Pediatric Rehabilitation** (arr.) Koch and Staff
Acute and chronic disabling disorders in infants and children. Normal neuromuscular development and physical examination, with emphasis on posture and movement. Electrodiagnostic techniques and the use of non-M.D. therapists in rehabilitation. Observation of pathologic states referred for treatment, including the prescription of braces and adaptive equipment. Children's Hospital.

404 **Being an Effective Teacher** (3) Greenberg
Theory of problem solving, learning of preference styles, and interpersonal skills that affect teaching. Assigned readings and assessment of teaching and learning styles and teaching effectiveness. Children's Hospital.

501 **Embryologic Basis of Pediatric Surgical Disease** (3) Newman
The embryogenesis of congenital defects and the principles underlying their diagnosis and surgical correction. Lectures, seminars, and readings. Children's Hospital.

## Computer Medicine

*Chair:* W. S. Yamamoto

101 **Practical Computing for New Health Practitioners** (3) Orthner
Introduction to computer technology for students with no previous background in computers or data communications. Lecture and laboratory.

201 **Theory of Medicine** (1) Yamamoto
Theoretical constructs implicit in the practice of medicine, with emphasis on decision theory. Other topics include the nature, origin, and organization of medical knowledge, focusing on statistical reasoning.

**252 Introduction to Interactive Computing** (1) Orthner and Staff
Introduction to PC-based interactive computing and software packages for applications such as word processing, spreadsheets, database management, telecommunications, and electronic mail. Basic elements of computer programming. Successful completion of this course will satisfy the medical computing competency requirements for first- and second-year medical students. Enrollment limited. Open to non-medical students with permission of instructor.

**253 Medical Computing** (1) Yamamoto
Aspects of computer use, including preparation and execution of programs that involve clinical or research applications, such as ECG analysis, medical file management, mathematical modeling, and managerial computing.

**353 Medical Computing** (arr.) Yamamoto, Orthner
For senior medical students. Aspects of computer use, including preparation and execution of programs that involve clinical or research applications, such as ECG analysis, pulmonary function calculation, medical file management, mathematical modeling, data processing, and managerial computing. Tutorial or classroom instruction, depending on enrollment.

**354 Automated Medical Measurement Systems** (5) Tidbal
Students work under supervision in a multiphasic screening clinic and participate in implementation and evaluation of the system. Seminar discussions related to clinical practice, preventive medicine, and occupational medicine. Four-week elective periods. Warwick Building.

**390–91 Extramural Computer Medicine Elective** (arr.)
Elective periods at other institutions.

**502 Mathematical Models and Decision Theory** (3) Yamamoto
For senior medical students. Systematic review of mathematical and computational approaches to medical decision analysis and representations of biomedical information. Models deal with physiological systems in heuristic and decision algorithms and with formulation of medical information for automated diagnosis and prognosis. Students should have some background in probability and differential equations and must complete a project involving computers. Warwick Building.

## Dermatology

*Chair:* M. L. Elgart

**380 Dermatology Clinic** (5) Elgart and Staff
Conferences, lectures, and attendance at dermatology clinic. Diagnosis and treatment of common skin disorders, dermatologic surgical procedures, technique for using liquid nitrogen, culture and identification of fungi, microscopic diagnosis of common cutaneous diseases. Four-week elective periods. Medical Faculty Associates.

**381 Dermatology Clinic** (5) Mitchell
Same as Derm 380. Four-week elective periods. Group Health Association

**382 Dermatology Clinic** (5) James and Staff
Same as Derm 380. Four-week elective periods. Walter Reed Army Medical Center.

**383 Dermatology Clinic** (arr.) Ruggles
Same as Derm 380. Four-week elective periods. Andrews AFB Hospital.

**385 Dermatology in General Medicine** (arr.) Nigra and Staff
Outpatient clinic two mornings a week, daily rounds on the inpatient and consultation services, consultations on all patients in hospital. Basic science conference and at least three hours of dermatology review slide sessions each

week. Advanced readings in dermatology. Supervision by chief resident. Washington Hospital Center.

386 **Private Office Practice** (arr.) Elgart
The department arranges for students to work in a private dermatology practice.

390–92 **Extramural Dermatology Elective** (arr.)
Elective periods at other institutions.

## Emergency Medicine

*Chair:* M. S. Smith

10 **Introduction to Prehospital Clinical Medicine** (5) Warner, Luedtke
Explores, through lectures and simulation exercises, the role and responsibilities of the emergency medical technician/ambulance (EMT/A). Patient assessment, basic life support, hemorrhage control, bandaging, splinting, and extrication techniques. Observation of emergency care delivery in a local setting. Certification training in cardiopulmonary resuscitation. Upon successful completion, the student is eligible to take the national registry EMT/A examination.

11 **EMT/A Review** (2) DeAtley, Luedtke
Review of information and skills for the emergency medical technician preparing to take a state recertification examination. Includes CPR certification, EOA, and MAST training. Prerequisite: current EMT/A certification and EMed 10 or equivalent.

12 **Preliminary Emergency Care** (2) Staff
Classroom and laboratory instruction that follows the Department of Transportation's first-responder course guidelines. Topics include airway management, CPR, hemorrhage control, bandaging, and splinting. Upon successful completion, the student is eligible to take a state first-responder certification examination.

13 **First-Responder Review** (2) Staff
Review of information and skills for the first-responder preparing to take a state recertification examination. Includes CPR certification. Prerequisite: current first-responder certification and EMed 12 or equivalent.

18 **Emergency Medical Services and the Health Care System** (3) Schottke
Organization and management of emergency medical services systems. Service delivery methods, the relationship of emergency medical services to the overall health care system, and the roles of federal, state, and local governments and the private sector in delivery of emergency care. Prerequisite: EMed 180 or equivalent.

20 **Management Communication Skills** (3) DeAtley
Development of skills in report and proposal writing, record keeping, and oral presentation.

30 **Design of Emergency Medical Services Communication Systems** (3) Schottke
Introduction to communication networks in the emergency medical services system, including communication systems design, dispatch protocols, triage, and procedures for multiple-casualty incidents.

40 **Management of Emergency Services** (3) Schottke
Principles of personnel management and processes that contribute to the effectiveness of an organization. Topics include manpower training and use, resource allocation, vehicular design, and equipment purchase.

50 **Health and Safety Legislation** (3) Schottke
Survey of the methods used to develop health and safety legislation, including

the roles of federal, state, and local governments. Implications of such legislation for industry, the medical community, and the public.

55 **Legal Aspects of Emergency Management** (3) DeAtley
Legal issues in the delivery of emergency medical services, including abandonment, malpractice, negligence, patient consent, the Freedom of Information and Privacy Acts, the Good Samaritan law, protocol deviation, record keeping, patient refusal of services, and medical control. Emergency medicine legislation and recent court decisions.

61 **Prehospital Advanced Life Support I** (5) Warner
Role and responsibilities of the emergency medical technician/paramedic, including medical history and physical assessment techniques, pathophysiology, and management of shock, cardiac, respiratory, neurological, and abdominal emergencies. Overview of emergency medical services communication systems. Students are assigned to work in local emergency departments and ride with area paramedics. Laboratory sessions in patient assessment, advanced airway management, defibrillation, intravenous techniques, and IM/SQ injections. Prerequisite: EMed 10; concurrent registration: EMed 65.

62 **Prehospital Advanced Life Support II** (5) Warner
Assessment and management of emergencies in obstetrics, gynecology, trauma, pediatrics, adolescent medicine, and geriatrics. Prerequisite: EMed 10; concurrent registration: EMed 66.

63 **Paramedic Skills I** (1) Warner
Presentation of trauma management skills outlined in PHILS/BTLS course. Prerequisite: permission of instructor.

64 **Paramedic Skills II** (1) Warner
Presentation of cardiac emergency management skills outlined in the American Heart Association's ACLS course. Lecture and laboratory. Prerequisite: permission of instructor.

65 **Prehospital Clinical Practicum I** (9) Warner
Students rotate through a variety of clinical sites, including critical care units, operating rooms, renal dialysis departments, and mobile intensive care units. Concurrent registration: EMed 61.

66 **Prehospital Clinical Practicum II** (9) Warner
Students rotate through a variety of clinical sites, including critical care units, burn units, labor and delivery rooms, and mobile intensive care units. Concurrent registration: EMed 62.

67 **Extrication and Rescue Techniques** (3) Staff
Techniques used in gaining access to and evacuating the injured. Vehicular accident extrication, high-rise and water rescue, electrical emergencies, and use of ropes.

68 **Arrhythmia Recognition for Emergency Clinicians** (1) Warner
Fundamentals of electrocardiography and interpretation of basic ECG patterns. Common errors in taking and reading ECGs, with emphasis on identification of normal and abnormal wave patterns. Effects of drugs and electrolyte imbalance on ECG patterns.

100 **Educational Planning and Assessment for Emergency Managers** (3) DeAtley
Theories and principles of learning and teaching, including development of effective course objectives, lecture outlines, and examinations.

110 **Stress Management** (3) Schottke
Impact of stress and burnout on emergency personnel. Causes and effects of stress, short-term stress counseling techniques, effective coping mechanisms, and time-management skills.

115 **Emergency Management Information Systems** (3) Staff
Introduction to the use and application of microcomputers in emergency medical services. Basic programming concepts, comparison of computer

assisted systems, use of microcomputers in inventory control, performance evaluation, and resource allocation. Prerequisite: Educ 180 or equivalent.

140 **Analysis of Emergency Medical Services Systems** (3) Staff
Planning and evaluation of emergency medical services, using various analytical models to examine the components of an emergency medical services system. Prerequisite: EMed 40; concurrent registration: HSA 170.

150 **Disaster Management and Planning** (3) DeAtley
Planning for and management of multiple-casualty incidents in the prehospital and hospital environment, including development of response plans, triage, medical evacuation procedures, communications, roles of government and the private sector, terrorism, and medical care for mass gatherings.

151 **Medical Management of Hazardous-Materials Incidents** (3) DeAtley
Hazardous materials and their risks. Identification of hazardous materials and related problems, precautions in approaching the contaminated patient, protective clothing, decontamination, and management of selected hazards. Prerequisite: EMed 10 or equivalent.

170 **Introduction to Safety and Occupational Health** (3) Staff
Overview of the safety movement. Economic impact of accident-related losses and methods of reducing such losses. Roles of safety and occupational health in minimizing risks and losses.

171 **Environmental Aspects of Safety and Occupational Health** (3) Staff
Health and safety concerns related to workplaces and equipment. Examination of environmental conditions conducive to accidents and methods for monitoring these conditions.

172 **Accident Prevention** (3) Staff
Overview of accident prevention and loss control. Introduction to comprehensive safety concepts and methodology. Prerequisite: EMed 170.

173 **Assessment of Accident Risks** (3) Staff
Methods of obtaining, recording, and analyzing information related to causes of accidents in the community. Prerequisite: EMed 170, 171, 172.

180 **Leadership Skills** (3) DeAtley
Development of skills in listening, delegation of responsibilities, discipline, and decision making.

181 **Integrated Emergency Management** (3) Staff
Identification of agencies involved in disaster response and development of an integrated emergency management system. Prerequisite: EMed 150.

182 **Public Education and Media Relations** (3) Staff
The role of the media in emergency medical services explored through classroom discussion with media representatives. Advantages and disadvantages of media coverage. Methodologies for public education about emergency medical services.

183 **Office Management** (2) Staff
Setup and management of an office, including establishment of filing systems, selection of office equipment, communication techniques, public relations, and marketing.

185 **Emergency Management Research Design** (3) Staff
Basic principles and methods of data collection, analysis, and reporting. A research project is required. Prerequisite: EMed 18; concurrent registration: Stat 51.

190 **Seminar: Advanced Topics in Emergency Management** (3) Staff
Management issues, such as labor relations, collective bargaining, contract negotiation, financing, and formulation of public policy. Prerequisite: permission of instructor.

199 **Independent Study** (3) Staff
Individual research project in an area relevant to emergency medicine. For undergraduate seniors with permission of program faculty.

**200 Emergency Management Administrative Internship** (13) DeAtley
The student is assigned to a local emergency medical service agency to assist in the administration of its health care delivery program. Opportunity to evaluate health care service delivery and to devise protocols and regulations.

**201 Cardiopulmonary Resuscitation Practicum** (0) DeAtley and Staff
Mechanical skills for providing basic cardiac life support (BCLS). Upon completion of EMed 201 and 230, the student receives BCLS certification.

**230 Emergency Medicine I** (2) DeAtley, Scott
Required course for first-year medical students. Lectures, demonstrations, and practice sessions on basic prehospital assessment and stabilization. Upon completion of EMed 201 and 230, the student receives BCLS certification.

**231 Emergency Medicine II** (1) Chen, DeAtley, and Staff
Elective supplement to and expansion of EMed 230. The student is expected to develop proficiency equivalent to that of an emergency medical technician. Opportunities to spend time on a basic life support ambulance or a mobile intensive care unit. The student will receive BCLS certification after successful completion of the course. Prerequisite: EMed 230.

**302 Emergency Medicine** (3) Scott and Staff
Required for senior medical students. Rotating clinical shifts in the emergency unit of the University Hospital under supervision of the faculty and residents of the Department of Emergency Medicine. Videotaped lectures, daily student conferences, and required readings. Two-week rotation with ten required clinical shifts.

**311 Emergency Medicine** (arr.) M. Smith
Two- or four-week elective in emergency medicine in a suburban community hospital. Participation in relevant conferences at Holy Cross and the weekly emergency medicine grand rounds series. Prerequisite: EMed 302. Holy Cross Hospital.

**312 Emergency Medicine Elective** (arr.) Scott
Four-week elective for the student interested in emergency medicine as a career. The student is assigned a faculty preceptor and combines clinical experience with a research or administrative project. Prerequisite: EMed 302.

**320 Comparative Emergency Medical Services Systems** (arr.) Adams, Chen
Time is divided among EMS systems in the District of Columbia, Montgomery County, and Fairfax County. The student accompanies prehospital advanced life support providers and must complete assigned readings and a short written report on a prehospital care topic. Prerequisite: permission of instructor and, for visiting students, EMed 302 or equivalent.

**330 Clinical Toxicology** (5) J. Smith
Under supervision, students work in the National Capital Poison Control Center at Georgetown University Hospital, responding to requests for information from the public and medical community. Also includes a series of seminars. Four weeks only. Prerequisite: EMed 302 and permission of instructor.

**340 Research Elective in Emergency Medicine** (5) Rosenthal
Participation in ongoing research activities of the Department of Emergency Medicine.

**350 Wound Management** (arr.) Peterson
Wound care, including preparation, cleansing, debridement, anesthesia, repair, dressings, splints, and after-care instruction, under the supervision of emergency department staff. Two or four weeks.

**390–93 Extramural Emergency Medicine** (arr.)
Elective periods at other institutions.

## Health Care Sciences

*Acting Chair:* L. G. Pawlson

**Courses numbered 10 to 96 are open only to military personnel in off-campus health sciences programs.**

10 **Anatomy and Physiology** (3) Staff
Study of the human body. Etiology, arthrology, myology, hematology, immunology. Circulatory, respiratory, digestive, endocrine, excretory, nervous, and reproductive systems.

11 **Applied Anatomy and Physiology** (4) Staff
Application of anatomical and physiological principles. Control of hemorrhage, methods of resuscitation, management of shock, relief of pain. Physical examination, nutrition, fluid and electrolyte balance, respiratory conditions, childbirth.

12 **Mathematics for Health Providers** (2) Staff
Provides a basis for understanding the equations used to calculate the effect of undersea pressure on the human body and the information necessary to apply these calculations to appropriate therapy, such as drug dosage and other modes of treatment.

15 **Pharmacology and Toxicology** (arr.) Staff
Pharmaceutical mathematics, terminology, preparations, compounding, physiological action and potential toxic reactions of certain drugs, legal aspects of drug regulations.

16 **Clinical Laboratory Techniques and Procedures** (arr.) Staff
Laboratory procedures used in basic health maintenance. Use of microscope, complete blood count, acid-fast stain, urinalysis, blood sedimentation rate, RPR card test, coagulation and bleeding time, blood grouping, blood typing.

20 **Radiation Biology** (2) Staff
Effects of ionizing radiation on various cells, tissues, organs, and the human body as an integrated unit. Organic and inorganic molecules; the human immune system; possible genetic effects and long- and short-term effects of radiation. History and use of radiation therapy, including therapy modalities, classification of neoplasms, types of therapy units, and treatments.

21 **Health Physics** (4) Staff
Concepts of radioactivity, including beta decay, isometric transmissions, electron capture, internal transition, alpha decay, the auger effect, isotopic half-life, secular and transient equilibrium, artificial transmutations, nuclear reactions, and counting of statistics.

22 **Introduction to Epidemiology** (1) Staff
Study of common communicable diseases, immunologic factors, and procedures. Contact interviewing and reporting of communicable diseases.

25 **Management of Medical and Surgical Emergencies** (7) Staff
Basic techniques used in treating life-threatening situations. Clinical procedures include cardiopulmonary resuscitation, hemorrhage control, minor surgical procedures, and venous cutdowns. Dealing with drug overdose and treatment of acute medical problems.

26 **Medical Diagnosis and Treatment** (arr.) Staff
Introduction to the recognition of clinical disease states and determination of appropriate diagnostic techniques, with emphasis on advanced technology. Review of therapeutic approaches.

54 **Techniques in Cardiac Resuscitation** (2) Staff
Basic cardiac life support techniques and skills needed in basic life support instruction training.

66 **Radiologic Fundamentals and Radiation Health** (arr.) Staff
Basic concepts used in diagnosis of disease using radiologic equipment. Commonly used positions, degrees of X-ray penetration, protective measures for patients and technologists. Safety techniques and acceptable units of radiation exposure. Review of NRC regulations, accountability, records, receipt of materials, and storage.

67 **Disaster Sanitation** (3) Staff
Survey of nuclear, biological, and chemical hazards, with emphasis on detection, protection of personnel, and related issues.

68 **Environmental Sanitation** (1) Staff
Study of environmental factors that contribute to human health: food, water, living and working spaces, economics, and pest control.

75 **Dental Fundamentals** (2) Staff
Overview of dental record screening, oral examination, X-ray interpretation, administration of anesthesia, and dental, endodontal, and periodontal treatment.

83 **Alcohol and Drug Abuse** (2) Staff
Types and magnitude of substance abuse, ethical and medical issues, impact on the family, and treatment.

87 **Surface Radiation Health** (3) Staff
Sources of radiation and radiation services and programs available in the U.S. Navy.

90 **Occupational and Environmental Health** (arr.) Staff
Basic environmental hazards, such as chemical and industrial exposure. Prevention and treatment of exposure to toxic substances. On-site evaluation of safety hazards and unsafe practices in the workplace.

92 **Medical Material Management** (4) Staff
Material management in the medical facility. Budgeting, purchasing, material receipt and inspection, inventory of equipment and supplies, controlled medicinals, stock record cards, surveys and adjustments, classes of plant property, property accountability, storage requirements.

93 **Health Systems Administration I** (arr.) Staff
Health systems organization. General office procedures, standard subject identification codes, filing systems, records disposal, security of patient information, correspondence, procedural manuals.

94 **Health Systems Administration II** (4) Staff
Planning office systems, procedures, environment, and location. Quality control, work measurement methods, authority and organizational relationships, principles of office organization, employee supervision.

95 **Records Management** (6) Staff
Health records management. Classification of personnel, personnel records, promotions, educational services, career development, personnel orientation, medical care eligibility, patient data systems, statistical analysis.

96 **Clinical Experience** (arr.) Staff
Supervised experience and research. Practical application of principles studied in the classroom.

100 **Clinical Medicine Review** (5) Staff
For students in the physician assistant program who fail to meet the minimum scholarship requirement in the core curriculum by the end of the clinical year. Prerequisite: permission of program director.

101 **Environmental Biostatistics** (3)
Statistical reasoning, collection of data, rates, incidence, and prevalence. Generalization of observations and use of measurement data. For off-campus students.

102 **Food and Water Sanitation** (3) Staff
General characteristics of urban and rural water systems: treatment and distribution, public bathing place sanitation, design and function of water treatment facilities. Dairy products and food sanitation: processing, storing, and distributing food. Supervision and training of food industry personnel.

103 **Academic Curriculum Tutorial** (arr.) Staff
For students in the physician assistant program who fail to meet the requirement for satisfactory performance in one or more subject areas in the first-year curriculum. Prerequisite: permission of program director.

109 **Human Behavior I** (2) Stein
Basic knowledge of psychiatry needed to enter clinical work. Mental status examination as a tool of clinical assessment. Approaches to understanding and working with psychiatric patients. (Fall)

113 **Preventive Medicine and Epidemiology for Physician Assistants** (2) Cawley
Basic concepts of public health and epidemiology, with emphasis on those applicable to primary care practice. Topics include biostatistics and use of clinical epidemiology in interpreting medical literature. (Spring)

116 **Medical Terminology** (0) Stein
Autotutorial completed before entering the physician assistant program. Terminology and vocabulary basic to all areas of medical science, hospital service, and allied health specialties.

119 **The Physician Assistant Role in Modern Health Care** (2) Cawley
The role of physician assistants in health care delivery, with emphasis on determinants of health, organizational forces in the health care system, health policy and health financing issues, medical ethics, and legal and economic aspects of the health professions.

120 **Biochemistry for Allied Health Sciences** (2) Staff
Basic concepts of biochemistry and their relation to the allied health field. For off-campus students.

121 **Microbiology for New Health Practitioners** (2) Staff
Basic concepts of microbiology and principles of microbial defense. Study of microorganisms of medical importance. For off-campus students.

122 **Public Health Microbiology** (3)
Application of basic microbiology, general principles of immunology and virology, development of a surveillance protocol for nosocomial infection. For off-campus students.

125 **Manifestations of Disease** (5) Johnson, Stein
Interdisciplinary course in the theory of medicine using an organ system approach. Clinical findings and pathophysiology for a wide spectrum of diseases. Diagnosis and management of diseases in a variety of medical and surgical specialties. Prerequisite: Anat 115, Phyl 111. Open to graduate students with permission of instructor.

126 **Clinical Approach to Diagnosis** (arr.) Staff
Equips the student with the basic skills needed to recognize clinical symptoms and arrive at a provisional diagnosis. For off-campus students.

127 **Clinical Medicine I** (arr.) Staff
Introduction to the recognition of the clinical disease state, integrating knowledge acquired in the basic sciences. For off-campus students.

128 **Clinical Medicine II** (arr.) Staff
Continuation of HCS 127, with emphasis on advanced technology used in diagnosis and review of the therapeutic approach. Prerequisite: HCS 127. For off-campus students.

131 **Human Behavior II** (2) Staff
Continuation of HCS 109. (Spring)

**133 Introduction to Clinical Assessment** (arr.) Staff
Clinical interviewing and physical examination. The student should attain a beginner's level of clinical competence. For off-campus students.

**134 Clinical Assessment** (arr.) Staff
Patient interviewing and physical examination, including integration of data obtained from the newer and more sophisticated modes of diagnostic technology. (Fall) Povar

**137 Issues in Health Care** (1)
Practitioner–patient interaction and the roles of law, ethics, economics, and government in the health care system. Bargmann

**140 Clinical Decision Making** (2)
Methodological approach to clinical problem solving, with emphasis on interpretation of patient histories, physical examinations, laboratory results, and X-rays. Selection of appropriate pharmacological and nonpharmacological therapies. Students assist in analysis of clinical cases under faculty supervision and learn to evaluate symptoms in relation to pathophysiological changes. Open to graduate students with permission of instructor. Johnson

**142 Nurse Practitioner Seminar I** (3)
Current developments in the role of the nurse practitioner, with emphasis on history taking and communication skills. Johnson

**143 Nurse Practitioner Seminar II** (2)
Continuation of HCS 142. Johnson

**144 Nurse Practitioner Seminar III** (3)
Continuation of HCS 143. Ettar

**145 Topics in Pediatrics** (1)
Topics covered include growth and development, child safety, common respiratory infections, asthma, and abdominal disorders. Ettar

**146 Topics in Emergency Medicine for Physician Assistants** (1) Ettar
Evaluation and treatment of the patient with an urgent problem. Review of signs and symptoms, accompanying physical findings, and methods for diagnosis and treatment of a spectrum of emergent illnesses. Development of skills used in the clinical year, including suturing, gowning and gloving, CPR and ACLS certification, cast application, intubation, and catheterization.

**147 Introduction to Radiology** (1) Ettar
Principles and language of radiologic imaging. Radiologic anatomy. Development of a systematic approach to radiology. Normal and abnormal radiological findings. Stein

**148 Introduction to Electrocardiography** (1)
Fundamentals of electrocardiography and interpretation of basic ECG patterns. Common errors in taking and reading ECGs, with emphasis on identification of normal and abnormal wave patterns. Effects of drugs and electrolyte imbalance on ECG patterns. Adams

**153 Gynecology Outpatient: Nurse Practitioner** (arr.) Adams
Elective rotation for nurse practitioner students. Management of gynecological problems in ambulatory setting.

**154 Clinical Geriatrics** (arr.) Adams
Required rotation for nurse practitioner students. Students develop individual study and learning objectives in conjunction with their faculty advisers.

**157 Primary Care Preceptorship: Nurse Practitioner** (arr.) Adams
Required four-week rotation for nurse practitioner students. All aspects of patient management in ambulatory setting. Staff

**158 Cardiothoracic Medicine Elective for Physician Assistants** (4)
Elective four-week clinical rotation selected with faculty approval. Under the supervision of the preceptor, students assist in the care of patients with

problems commonly seen in this specialty and learn to collect and integrate information on these patients.

159 **Dermatology Elective for Physician Assistants (4)** Staff
Elective four-week clinical rotation selected with faculty approval. Under the supervision of the preceptor, students assist in the care of patients with problems commonly seen in this specialty and learn to collect and integrate information on these patients.

160 **Medical Inpatient (5)** Alexander
Six-week rotation in which the student learns to collect and integrate information on the medical problems of patients who have been admitted to the hospital. The student is part of a medical team under the supervision of the medical resident or attending physician and is on regular call. Attendance is required at all work rounds, lectures, and conferences.

163 **Medical Outpatient (5)** Alexander
Six-week rotation in which the student learns to collect and integrate information on the various medical problems encountered in the ambulatory setting, such as an outpatient clinic, an HMO, or a community health center. Emphasis on differential diagnosis, patient management, and preventive medicine. The student is part of a health care team under a physician's supervision.

165 **Medical Outpatient: Nurse Practitioner (arr.)** Adams
Elective rotation for nurse practitioner students, arranged with approval of advisor. Aspects of specialty patient management in ambulatory setting.

166 **Surgical Inpatient (5)** Alexander
Six-week rotation in which the student learns to collect and integrate information on admitted surgical patients and gains experience in their pre- and post-operative management. Students assist during operative and ward procedures and function as part of the surgical team under a physician's supervision.

169 **Obstetrics and Gynecology (5)** Alexander
Six-week rotation in which the student learns to collect and integrate information on obstetrical and gynecological patients. Students assist in outpatient gynecological and inpatient obstetrical practice as part of the health care team under a physician's supervision.

170 **Obstetrics and Gynecology: Nurse Practitioner (arr.)** Adams
Elective rotation for nurse practitioner students. Students develop individual study and learning objectives in conjunction with their faculty advisors.

171 **Pediatric Outpatient: Nurse Practitioner (arr.)** Adams
Elective rotation for nurse practitioner students. Ambulatory pediatric practice.

172 **Pediatric Outpatient (5)** Alexander
Six-week rotation in which the student learns to collect and integrate information about the medical problems of the pediatric outpatient, under the direction of a pediatrician. Normal growth and development, pediatric history and physical examination, and management of common pediatric illnesses.

174 **Primary Care (5)** Staff
Required rotation for off-campus allied health students. All aspects of primary care medicine. Hospital rounds with attending physicians.

175 **Primary Care Preceptorship (arr.)** Staff
Seven-week experience in which the student functions as a physician assistant in a primary care setting. Appropriate primary care areas include pediatrics, internal medicine, family practice, and emergency medicine.

176 **Emergency Medicine Elective for Physician Assistants (4)** Alexander
Elective four-week clinical rotation selected with faculty approval. Under the supervision of the preceptor, students assist in the care of patients with

problems commonly seen in this specialty and learn to collect and integrate information on these patients.

177 **General Medicine Elective for Physician Assistants** (4) Alexander
Elective four-week clinical rotation selected with faculty approval. Under the supervision of the preceptor, students assist in the care of patients with problems commonly seen in this specialty and learn to collect and integrate information on these patients.

178 **Emergency Medicine** (arr.) Alexander
Rotation in which the student learns to collect and integrate information on patients in an emergency room. Experience with a variety of emergency situations through rotating shifts. The student functions as part of the emergency medical team under the supervision of a physician.

179 **Emergency Medicine: Nurse Practitioner** (arr.) Adams
Rotation for nurse practitioner students. Medical and surgical emergency management problems.

180 **Practicum in Environmental Health** (arr.) Staff
Supervised fieldwork. Food service, housing, water, sewage and solid waste, and infectious diseases. Occupational health problems. Reports and conferences.

181–82 **Introduction to Environmental Science** (3–3) Staff
General characteristics of urban and rural water systems: treatment and distribution, public bathing place sanitation, design and function of water treatment facilities. Recognition and control of environmental pollution. Treatment and disposal of human wastes. Food sanitation: processing, storage, and distribution. Effects of major pollutants on people. Radiological safety. For off-campus students.

183 **Introduction to Industrial Hygiene** (3) Staff
Chemical hazards: diseases caused by chemical exposure, toxic dust, metal fumes and vapor, gases and organic compounds. Physical hazards: biological effects of low and high temperatures, radiation (electromagnetic, ultraviolet, ionizing), illumination, sound, pressure, and atmospheric pollution. For off-campus students.

184 **Public Health Organization and Administration** (3) Staff
Public health activities, organization, and philosophy. Vital statistics, laboratory services, education, nursing, and social services. Administrative considerations, including governmental aspects, fiscal management, personnel factors, and public relations in public health organizations. For off-campus students.

185 **Environmental Impact and the Law** (3) Staff
Rationale for environmental impact statements and government agencies responsible for these statements. Current statutes and regulations pertaining to the environment. For off-campus students.

186 **Orthopaedics Elective for Physician Assistants** (4) Alexander
Elective four-week clinical rotation selected with faculty approval. Under the supervision of the preceptor, students assist in the care of patients with problems commonly seen in this specialty and learn to collect and integrate information on these patients.

187 **Radiology Elective for Physician Assistants** (4) Alexander
Elective four-week clinical rotation selected with faculty approval. Under the supervision of the preceptor, students assist in the care of patients with problems commonly seen in this specialty and learn to collect and integrate information on these patients.

188 **Shock Trauma Elective for Physician Assistants** (4) Alexander
Elective four-week clinical rotation selected with faculty approval. Under the supervision of the preceptor, students assist in the care of patients with

problems commonly seen in this specialty and learn to collect and integrate information on these patients.

189 **Alcohol Rehabilitation Unit** (3) Staff
Psychological and therapeutic approaches to care and rehabilitation of patients with alcohol-related disturbances. For off-campus students.

190 **Dermatology** (1) Staff
Clinical assessment of common dermatologic conditions found in the ambulatory care setting. For off-campus students.

191 **Eye, Ear, Nose, and Throat** (3) Staff
Diagnostic and therapeutic approaches to diseases of the eyes, ears, nose, and throat. For off-campus students.

192 **Orthopaedics** (3) Staff
Diagnosis and treatment of common orthopaedic problems found in the primary care setting. For off-campus students.

193 **Clinical Aspects of Aging** (2) Johnson
Common clinical problems of the elderly. Discussion of the demography, etiology, pathophysiology, diagnostics, and management of select problems. Health maintenance concepts. Issues concerning health policy and the aged.

194 **Practicum in Gerontology and Geriatric Care** (arr.) Staff
Supervised fieldwork with the elderly or in administration and planning for the elderly. Offered in cooperation with other schools and departments of the University. For medical students and for undergraduate and graduate students in the social sciences and health services administration.

195 **Ophthalmology** (2) Staff
Recognition and management of common ophthalmologic problems. Performance of thorough ophthalmologic exams (excluding refraction) and provision of routine eye care. For off-campus students.

196 **Issues in American Health Care** (arr.) Povar
Fieldwork combined with academic study of the health care system and its problems: cost, quality of care, delivery of care, ethical issues, health education, consumer issues. Field placements (12 to 20 hours per week) in appropriate health-related activities. Admission by permission of instructor. Undergraduate students only. **(Fall and spring)**

197 **Current Issues in Bioethics** (1) Staff
Interdisciplinary approach to problems of bioethics. Presentations by physicians, lawyers, economists, philosophers, and health care administrators.

198 **Psychiatry** (4) Alexander
Four-week rotation in which the student learns to collect and integrate information on psychiatric patients. The student is part of the therapeutic community and assists in identification and treatment of the psychiatric patient.

199 **Independent Study** (arr.) Staff
Required rotation in an area of study chosen by the student and approved by the faculty. Students develop learning objectives in conjunction with their faculty advisors.

201 **Practicum in Geriatric Care** (1) McConnell
Geriatric assessment, including interviewing, physical exam, and functional assessment in outpatient and institutional settings. Participation in home visits and interdisciplinary seminars.

205 **Diagnosis and Management of Health Deviations** (5) Johnson, Stein
Common health deviations of adults, with emphasis on the normal physiological and pathophysiological aspects of systems functioning. The systematic assessment and management of health deviations that forms the foundation of clinical decision making for adult/gerontological nurse practitioners in primary care. Primarily for students in the graduate program in primary care nursing offered in collaboration with George Mason University.

206 **Clinical Decision Making** (2) Povar
Methodological approach to clinical problem solving, with emphasis on interpretation of patient histories, physical examinations, laboratory results, and radiographs. Selection of appropriate pharmacological and nonpharmacological therapies. Patient education, counseling, and referral. Students assist in analysis of clinical cases under faculty supervision and learn to evaluate symptoms in relation to pathophysiological changes. Primarily for students in the graduate program in primary care nursing offered in collaboration with George Mason University.

207 **Practicum in Advanced Health Assessment** (arr.) Staff
Application of advanced health-assessment and clinical decision-making skills, with emphasis on the collection of data needed to make a comprehensive health assessment. Students work with adult patients in primary care settings under faculty supervision. Primarily for students in the graduate program in primary care nursing offered in collaboration with George Mason University.

232 **Studying a Study: Methods for Reading the Medical Literature** (1) Riegelman
Required course for first-year medical students. Principles of analyzing medical journal articles, with emphasis on nonmathematical epidemiology and biostatistical principles and illustrations of errors that can occur in research articles.

233 **Epidemiology and Medical Decision Making** (1) Riegelman
Required course for second-year medical students. Principles of epidemiology and diagnostic testing. Rates of disease, assessment of risk and disease causation, and concepts of reproducibility, range of normal, sensitivity, and specificity. Case studies in epidemiology and introduction to diagnostic decision analysis.

301 **Clerkship in Primary Care** (8) Staff
Required for third-year medical students. Care of patients in ambulatory settings, including the George Washington University Health Plan (HMO) emergency room, and office practices of internists, pediatricians, and family practitioners. Emphasis on specialty areas that contribute to a physician's capacity to care for common minor illnesses: orthopaedics, otolaryngology, dermatology, and ophthalmology. Participation with District of Columbia Fire Department in responding to ambulance calls. Six-week elective periods throughout the academic year.

350 **Ambulatory Health Care** (arr.) Pawlson
Research or clinical experience in primary medical care, including geriatric medicine. Participation in a project relating to health care delivery, including medical audit, study of organization of health services, and problems of underserved (especially elderly) populations. Clinical experience is arranged. Exchanges with similar programs in other institutions are possible, especially for those participating in model family practice units.

361 **Family Practice Preceptorship** (arr.) Pawlson
Family practice preceptorship in rural Maryland, supervised by board-certified family practitioners in the Garrett County Medical Center. The physicians are affiliated with the University of Maryland Family Practice Program, of which this site is a part.

362 **Rural Family Practice Preceptorship** (arr.) Pawlson
Family health care in a small coal mining town in central West Virginia, supervised by board-certified family practitioners. The Somersville Hospital Family Practice Center includes facilities for outpatient, inpatient, and emergency services. Four-week elective periods.

363 **Geriatric Medicine** (arr.) Pawlson and Staff
Clinical experience at a congregate housing facility, outpatient practice, hospital home visits, and a long-term facility. Opportunity to supplement experience with activity at senior centers and day care facilities.

369 **Issues in Health Care** (2) Povar
Required for second-year medical students. Overview of issues such as the organization of health care and the role of different professions, concerns of patients, the patient–practitioner relationship, and legal and ethical problems of medical practice. Individual and group projects, seminar discussions, and panel presentations by patients. (Fall)

390–94 **Extramural Health Care Sciences Elective** (arr.)
Elective periods in community medicine, emergency medicine, or family medicine at other institutions.

399 **Supervised Experience in Ambulatory Health Care** (5) Blatt
For fourth-year medical students by arrangement between the department and the dean's office.

400 **Medical Decision Making** (2) Riegelman
Required course for all medical students. Concepts necessary for understanding new diseases, new diagnostic technology, and new therapies, with examples of clinical applications. Principles of decision analysis, cost–benefit analysis, technology assessment, and preventive medicine. Applications of computers to clinical care.

502 **Organization and Financing of Health Care** (3) Birnbaum
Structural and financial factors that shape health care delivery in the United States, with emphasis on the organizational provider, although the role of the individual provider is also addressed.

504 **Medical Law for the Attending Physician** (3) Fiscina and Staff
Legal attempts to define professional conduct under varying clinical circumstances. Study of landmark cases and of the process used in the judicial system to analyze the reasonableness of professional conduct.

505 **Biomedical Ethics** (5) Moreno and Associated Faculty
An intensive course in ethics offered cooperatively with the medical schools at Georgetown, Howard, and Uniformed Services Universities. Subjects will be chosen from areas of current tension for the medical professions, including delineation of the physician and patient roles, informed consent, research issues, issues in death and dying, genetic counseling, practitioner's social responsibility, allocation of scarce resources, and federal health policy.

## Interdisciplinary Courses

First-year medical students are required to take Idis 212, administered by the Departments of Anatomy and Physiology. Second-year students are required to take an interdisciplinary program of study that includes Idis 301, Path 201, Phar 201 and 202, HCS 137, and Pchi 201. This program provides basic instruction in various clinical subjects and prepares students for clinical clerkships and electives in the third and fourth years.

212 **Neurobiology** (3) Staff
Same as Anat/Phyl 212. Integrated survey of the structure and function of the human nervous system. Lecture, clinical demonstration, and laboratory.

301 **Introduction to Clinical Medicine** (16) Staff
One-year course. Integrated, organ-oriented course, with emphasis on physical diagnosis. Basic instruction in child health and development, clinical problem solving, dermatology, gynecology, internal medicine (including subspecialties), neurology, obstetrics, ophthalmology, psychiatry, radiology, and urology. Experience in hospital-based physical diagnosis and history taking.

800 **Summer Remedial: Clinical Medicine** (16)

801 **Summer Remedial: Neurobiology** (3)

## Medicine

***Chair:*** J. C. Rios

***Directors of Divisions:*** A. M. Ross *(Cardiology)*, K. L. Becker *(Endocrinology and Metabolic Diseases)*, H. Fromm *(Gastroenterology)*, L. S. Lessin *(Hematology and Oncology)*, C. U. Tuazon *(Infectious Diseases)*, C. Tziraki *(Internal Medicine)*, S. V. Spagnolo *(Pulmonary Diseases and Allergy)*, R. Levin *(Acting Director, Rehabilitation and Physical Medicine)*, J. P. Bosch *(Renal Diseases)*, P. H. White *(Rheumatology)*

**201 Diagnostic Studies in Clinical Medicine** (1) Scott
Didactic sessions on physiopathology and its correlation to laboratory studies, practical sessions, and case problems related to the use of laboratory tests and other diagnostic procedures, with emphasis on decision making. Second-year students only.

**250 Introduction to Occupational and Environmental Medicine** (2) Chase
Health effects of various occupational and environmental hazards and pollutants, such as radiation, air and water pollution, toxic substances, and environmental extremes. Perspectives of basic research, federal regulation, labor/management, and the physician.

**305 Inpatient Clerkship** (10) Staff
Required for medical students. Comprehensive study of patients; history and physical examination; ward rounds, consultations, conferences, preceptorial teaching, seminars. V.A. and University Hospitals and Washington Hospital Center. Eight-week periods throughout the academic year.

**331 Medical Hematology–Oncology** (arr.) Tziraki and Staff
Assignment to a ward team dealing exclusively with oncologic problems, including many patients on chemotherapy protocols. Special conferences and regular house staff conferences. Students take night call with the ward team and are expected to function at the level of interns on the team. Four-week periods. University Hospital.

**332 Acting Internship in Medicine** (5) Tziraki
Assignment to a ward team. Responsibility for completing initial patient evaluation and diagnostic and therapeutic plans, writing all medical orders (countersigned by an M.D.), coordinating patient's care, writing progress notes, and dictating discharge summary. Night call with the ward team, supervision by team resident.

**333 Acting Internship in Medicine** (5) Curtin
Under the supervision of the medical resident and attending physician, student works with a patient-care team on a medical ward, does initial evaluation, and presents patient's problem at attending rounds and appropriate teaching conferences. Subspecialty consultants review patient's problem with student. Four-week elective periods. Washington Hospital Center.

**334 Acting Internship in Medicine** (5) O'Connell
Assignment to a patient-care team under direct supervision of a University resident on general medical wards. Problem-Oriented Medical Record System used. Students complete initial patient evaluation data base, are responsible for clinical management during hospitalization, write all orders (reviewed and cosigned by the resident), and present their patients at attending rounds and conferences. Close supervision and guidance by the team resident, attending physician, and subspecialty consultants. Four-week elective periods. V.A. Hospital.

**335 Acting Internship in Medicine** (arr.) Wisneski
Academically oriented acting internship in a community hospital setting. Emphasis on basic clinical medicine. Responsibilities of intern. Holy Cross Hospital.

336 **Medical Intensive Care** (5) — Schwab and Staff
Student works on a medical intensive care unit with intern-like duties, including night call. Four-week elective periods. Washington Hospital Center.

337 **Senior Clerkship in Medicine** (5) — Weiss and Associated Faculty
Assignment to a ward team that includes a medical resident and attending physician. Students are assigned patients, complete initial medical evaluations and diagnostic and therapeutic plans, and write all orders (countersigned by an M.D.). Night call approximately every third night. Attending rounds conducted by practicing physicians three times per week. Students are expected to attend the daily morning report and noon conference. Providence Hospital.

338 **Occupational and Environmental Medicine** (arr.) — Chase
Assignment to Washington Occupational Health Associates, which addresses the effects of occupational and environmental health hazards. Participation in clinical intervention, under physician's supervision. Emphasis on relationship of occupational and environmental medicine to practice of primary care. Opportunity to visit field sites is generally available.

339 **Occupational and Environmental Medicine** (arr.) — Welch
A clinical rotation, evaluating patients with a variety of occupational diseases or hazardous exposures. Student assumes primary responsibility for management of cases, including a visit to the workplace when feasible. Each student presents a seminar on a clinical topic.

348 **Infectious Disease** (5) — Wagner
Patients with a variety of infectious diseases are seen and evaluated in conjunction with an infectious disease Fellow and attending physician. Experience in consulting on ambulatory and hospitalized patients with various documented or potential infectious illnesses. National Naval Medical Center.

349 **Infectious Disease** (5) — Levy, Curtin
Clinical experience on infectious disease service. Daily work rounds, including lab, conferences, journal club. Four-week elective periods. Washington Hospital Center.

350 **Infectious Disease** (arr.) — Gordin and Staff
Introduction to the diagnosis and treatment of bacterial, viral, fungal, and mycobacterial infections. Students assume primary responsibility for infectious disease consultations in conjunction with Fellows, residents, and full-time faculty members. Clinical application of laboratory techniques used in the diagnosis and treatment of patients with infectious disease problems. Emphasis on the usefulness of rapid diagnostic techniques and pharmacology of antimicrobics. Students participate fully in all section activities. Four-week elective periods. V.A. Hospital.

351 **Infectious Disease** (arr.) — Tuazon and Staff
Clinically relevant aspects of microbiology and immunology; relevant aspects of patient history, physical, and laboratory examination. Experience in consultations on infectious disease and use of antibiotics.

352 **Cardiology** (5) — Hsu
Experience in ambulatory and hospitalized patient care, ECGs, graphics, CCU, exercise lab. Observation in cardiac catheterization laboratory. Four-week elective periods.

354 **Preceptorship in Cardiology** (5) — Ross
Placement with an affiliated Washington-area practicing cardiologist. Experience in office and hospital cardiology and electrocardiography.

356 **Cardiovascular Diseases** (arr.) — Haider, Meyer
Students participate in two clinical arenas: (1) nonemergent cardiac problems and (2) routine problems and their diagnostic evaluation. Rounds three times

weekly; weekly teaching conferences with members of the cardiology staff. Later assignment to a 12-bed critical-care unit that includes coronary patients and medical–surgical patients with intensive-care problems. Under supervision of a senior resident, student works up patients admitted to these units, attends daily rounds with teaching physicians, and assists in the care of critically ill patients and those with suspected myocardial infarction or cardiac arrhythmias. Includes experience with invasive monitoring and therapeutic techniques.

358 **Cardiology** (5) Lindsay and Staff
Participation in the clinical cardiology service of Washington Hospital Center. Bedside evaluation correlated with electrocardiography and other diagnostic studies, including stress testing, phonocardiography, echocardiography, cardiac catheterization, and nuclide angiography. Four-week elective periods. Washington Hospital Center.

359 **Coronary Care Unit** (5) Van Voorhees
Participation in the care of patients on the coronary care unit of Washington Hospital Center. Student works closely with house staff and attending staff. Emphasis on diagnosis and treatment of coronary disease, complications of infarction, diagnosis and treatment of arrhythmias, and selection of patients for surgical intervention. Four-week elective periods. Washington Hospital Center.

360 **Cardiology** (5) Fletcher* and Staff
Experience in clinical cardiovascular problems under supervision of cardiology staff. Emphasis on history, physical diagnosis, and noninvasive cardiovascular techniques. Role of cardiac catheterization and results in specific cases. Electrocardiography as a tool for evaluating the cardiovascular patient. Patient management. Teaching rounds and conferences. Four-week elective periods. V.A. Hospital.

361 **Cardiology** (arr.) Epstein, Bonow
Observation of all aspects of congenital and acquired cardiac disease. Participation in diagnostic and therapeutic work-up of patients and evaluation of acute and long-term effects of medical and surgical interventions. National Institutes of Health.

362 **Cardiac Catheterization** (arr.) Pichard, Lindsay
The student interviews and examines two patients before catheterization, analyzes the data available, and presents patients to the catheterization team. Observation of the performance of catheterization, participation in the analysis of hemodynamic and angiographic data, and discussion of the physiologic and pathologic processes involved and the therapy applicable to each case.

363 **Medical Intensive Care and Coronary Care Unit** (5) Wish
Evaluation and management of acute medical illness, including myocardial infarction; severe heart failure; cardiac dysrhythmia; respiratory, renal, and hepatic failure; GI bleeding; and acid–base and fluid–electrolyte disturbances. Procedures and devices used on the unit, including cardioversion, temporary and permanent cardiac pacemakers, right heart and arterial catheterization, intra-aortic balloon counterpulsation, invasive and noninvasive electrophysiologic study, mechanical ventilators, and oxygen therapy. Students take call every third night with a medical resident and intern. V.A. Hospital.

364 **Critical Care Medicine** (arr.) Combs
Evaluation and treatment of the critically ill, including physical examination, laboratory testing, ECG interpretation, invasive monitoring, ventilator management, dialysis, pharmacotherapy, and nutritional support. Physiol-

*Dr. Fletcher is Chief of Cardiology at the Veterans Administration Hospital.

ogy of normal organ system function and the pathophysiology of organ system failure.

370 **Endocrinology** (arr.) El-Khodary
Assignment as an acting intern to work with a second- or third-year resident. Admission and work-up of patients. Consultations of the general medical service on patients with endocrine problems. Daily rounds and weekly teaching conference to discuss endocrine problems. Opportunity for participation at D.C. General Hospital. In-depth evaluation of patients with endocrine problems; emergency care of patients admitted to medical floors and intensive care unit for life-threatening endocrine emergencies.

371 **Endocrinology** (5) Gaskin and Staff
Evaluation of patients referred to the endocrinology service, participation in planning diagnostic work-ups and therapy, and responsibility for case presentations and follow-up of those patients. Daily clinical rounds and weekly endocrine clinic and diabetic clinic. Weekly endocrine conference includes journal club and pediatric endocrinology once a month. Rounds and conferences at the V.A. and University Hospitals when possible. Daily review of assigned reading. Four-week elective periods. Washington Hospital Center.

372 **Endocrinology and Diabetes** (arr.) Ratner and Staff
Clinical experience in endocrinology and metabolism; emphasis on outpatient care of diabetes mellitus with longitudinal follow-up. Students examine patients and participate in the diagnosis and planning of therapy. Daily rounds, weekly diabetic pregnancy clinic, lectures, and case discussions. University Hospital.

373 **Endocrinology and Metabolism** (arr.) Becker and Staff
Clinical experience in endocrinology and metabolism. Students examine endocrine patients, make preliminary diagnoses, and assist in treatment. Daily clinical rounds; weekly endocrine clinic, diabetic clinic, and journal club; case discussions; lectures. Twice-weekly endocrine reviews based on assigned reading. V.A. Hospital.

375 **Endocrinology Research** (arr.) Becker
Participation in endocrinology and metabolism research laboratory. Introduction to chemical and technical aspects of endocrine research. Participation in ongoing research activities. Students learn appropriate procedures, such as radioimmunoassay of hormones, histopathologic techniques, atomic absorption spectrophotometry, and investigative approach to solving research problems. Prior interview with instructor required.

390–95 **Extramural Internal Medicine Elective** (arr.)
Elective periods at other institutions.

398 **Consultative Medicine** (5) Tziraki
Medical follow-up of patients on surgical, orthopaedic, psychiatric, and obstetrics and gynecology services. Didactic sessions on preoperative evaluation and perisurgical risk.

399 **General Internal Medicine Inpatient Service** (5) Tziraki
Medical consultative and follow-up services to patients on surgical, orthopaedic, psychiatric, and obstetrics and gynecology services. For students required to undertake remedial work because of unsatisfactory performance in their third-year rotations.

402 **Practicum in Immunologic Techniques** (arr.) Hollinshead and Staff
Methodology and/or application of hybridomamonoclonal antibody techniques, both human–human and mouse–mouse. Other monitoring procedures, such as enzyme-linked immunoassays, procedures for extraction of antigenic pieces, and monoclonal antibody-derived epitopes.

403 **Oncology** (arr.) Cohen
Participation in clinical management of patients with carcinoma on the oncology ward. Methods of clinical research are stressed. V.A. Hospital.

404 **Oncology** (arr.) *Young*
Current methods of evaluation and treatment of lymphomas, Hodgkin's disease, testicular tumors, and ovarian, breast, and other malignancies, including an overview of the spectrum of these diseases. Participation in patient care and review of clinical trials. Procedures such as bone marrow, liver biopsies, and other staging techniques. Each student works closely with an oncology Fellow. National Cancer Institute.

405 **Oncology** (arr.) *Priebat*
New patient consultations, ward rounds, and clinic involving patients with both hematologic malignancies and solid tumors. Daily discussions on selected topics in medical oncology. Interdisciplinary conferences with V.A. Hospital staff. Washington Hospital Center.

411 **Gastroenterology/Cardiology** (5) *Chang, Swamy*
Observation and assistance in upper endoscopy, colonoscopy, cardiac catheterization, and related procedures, at area hospitals. Work-up of selected cases, reading of relevant literature, and case presentation.

412 **Gastroenterology** (arr.) *Danish and Staff*
Work in a suburban office devoted to private practice of internal medicine with emphasis on gastroenterology. Office practice, hospital rounds at Holy Cross and Washington Adventist Hospitals, evaluation of problems, discussion with attending physicians and patients in terms of diagnosis and management, observation of and assistance in specialized GI procedures, and practical aspects of office management.

413 **Gastroenterology/Hepatology** (5) *Fromm and Staff*
Intensive clinical experience with patients who have diseases of the gastrointestinal tract, liver, and pancreas. Patient consultations, teaching rounds, seminars. Joint conferences with surgery, pathology, and radiology emphasize multidisciplinary approach to digestive diseases.

414 **Gastroenterology/Hepatology Nutrition** (arr.) *Seed*
Students work closely with Fellows in the gastroenterology/hepatology nutrition section, seeing patients on consultations and being involved in the initial evaluation, patient investigation, and follow-up. Close supervision by both the senior Fellows and senior staff. Direct or indirect participation in all specialized procedures involving various biopsy techniques and endoscopies. Teaching rounds, conferences, and seminars. V.A. Hospital.

415 **Gastroenterology** (arr.) *Gold*
Course includes direct patient contact on a consultative basis and participation in all section activities, including reviews of gastrointestinal pathology and radiology for individual patients and all procedures, particularly endoscopic. The student is expected to develop a basic knowledge of gastroenterology and to participate in a journal activity and may be called on to participate in a case presentation at monthly joint GI grand round sessions. Washington Hospital Center.

416 **Gastroenterology** (arr.) *Rudzki and Staff*
Participation in ward rounds with Fellows and attending physicians, endoscopic procedures (performed twice a week), journal club, GI medical–surgical conference, teaching conferences, and weekly clinic session. Direct responsibility for a number of consultations under the supervision of the GI Fellows. D.C. General Hospital.

417 **Gastroenterology** (arr.) *Wong*
Participation in daily inpatient and outpatient activities of the service. Walter Reed Army Medical Center.

418 **Gastroenterology** (arr.) *Volpe*
Participation in daily inpatient and outpatient activities of the service. National Naval Medical Center.

419 **Gastroenterology** (arr.) Gibbons
Responsibility for the care of patients admitted with GI problems and consultations on patients on other services. Daily rounds and weekly teaching conference. Observation of endoscopic procedures, including esophagogastroduodenoscopy, colonoscopy and polypectomy, laparoscopy, liver biopsies, and esophageal dilatation. Involvement with patients in the intensive care unit with acute gastroenterology problems. Providence Hospital.

423 **Gastroenterology** (5) Trujillo, O'Kieffe
Introduction to clinical problems in diagnosis and treatment of gastroenterology in both office and hospital practice. Peritoneoscopy, endoscopy, and biopsies. Four-week elective periods. University Hospital.

430 **Hematology** (arr.) Schechter* and Staff
Experience in the evaluation and treatment of patients with hematological disorders. Ward rounds, morphology review sessions, hematology clinic, and journal club. V.A. Hospital.

431 **Hematology/Oncology** (arr.) Lessin and Staff
Diagnosis and therapy of hematologic and oncologic disorders, including inpatient and outpatient consultations, daily care, and follow-up of clinical hematologic and oncologic problems. Emphasis on blood and marrow morphology, tumor pathobiology, modern hematologic/ oncologic diagnostic procedures, and treatment of blood diseases and cancer.

434 **Hematology/Oncology** (arr.) Yoo
Assignment with senior resident seeing patients with hematologic and tumor problems, interpreting blood smears and blood coagulation studies, and assisting in performance and interpretation of bone marrow examinations. Providence Hospital.

436 **Hematology Research** (arr.) Schechter* and Staff
Research interests of the staff include lymphocyte tumor biology stem cell culture and platelet production and hemostasis. Facilities available to do *in vitro* culture of human peripheral blood, bone marrow, and tumors; radioisotopic studies; and electron microscopy. V.A. Hospital.

440 **Pulmonary Medicine** (arr.) Spagnolo and Staff
Experience in the diagnosis and therapy of patients with pulmonary disease. Introduction to the management of patients with acute respiratory failure. Daily ward rounds, chest roentgenology review sessions, journal club, and physiology conference. Emphasis on modern pulmonary diagnostic procedures and current literature. V.A. Hospital.

441 **Pulmonary Disease** (arr.) Weiss
Responsibility for the care of patients admitted with pulmonary problems and consultations on patients on other services. Daily rounds and weekly teaching conference. Weekly pulmonary physiology conference in which arterial blood gases, pulmonary function testing, and principles of respiratory care are discussed in depth. Consultation services and daily care of a small number of inpatients. Observation of such procedures as pleural biopsy, thoracentesis, lung needle biopsies, and arterial puncture. Involvement on a consulting basis with all patients in the intensive care unit with acute respiratory problems. Providence Hospital.

442 **Pulmonary Disease** (5) Levit, Schwab, Friedman
Interpretation of pulmonary function studies. Daily teaching rounds and supervised consultation on patients with various pulmonary and infectious diseases. Participation in pulmonary clinic. Techniques and principles of respiratory therapy. Principles of and experience with respiratory failure and respiratory intensive care. Washington Hospital Center.

447 **Pulmonary Medicine** (5) Spagnolo and Staff
Experience in the diagnosis and therapy of patients with pulmonary disor-

*Dr. Schechter is Chief of the Hematology Section at the Veterans Administration Hospital.

ders. Ward rounds, chest roentgenology sessions, and journal club. Emphasis on modern pulmonary diagnostic procedures and current literature. University Hospital.

451 **Arthritis and Rheumatic Diseases** (5) White
Experience in the evaluation and treatment of patients with rheumatic diseases, including inpatient and outpatient consultations, daily care and follow-up, and clinical conferences. Discussion of selected topics in rheumatology, emphasizing differential diagnosis, pathophysiology, and therapeutic modalities.

452 **Rheumatology** (5) Nashel
Participation in the work-up and management of inpatients and clinic patients with rheumatic diseases. History, physical examination, differential diagnosis, immunological mechanism, X-ray reading, and use of laboratory tests stressed. V.A. Hospital.

453 **Introduction to Arthritis** (arr.) Barth
Work-up, rounds, clinic, and consultations on patients with arthritis and rheumatic diseases. Daily discussions on selected topics in rheumatology including clinical immunology, major disease categories (SLE, RA, gout, etc.), differential diagnosis, drug therapy, serological reactions, X-ray changes. Washington Hospital Center.

454 **Rheumatology and Orthopaedics (Pediatric)** (arr.) White and Staff
Students assist in the evaluation, treatment, and follow-up of children with rheumatic and orthopaedic problems. Responsibilities in outpatient and inpatient services; the student may elect to participate in operations. Discussion of selected topics in rheumatology and orthopaedics. Participation in clinical conferences, including physical medicine and radiology.

455 **Physical Medicine and Rehabilitation** (arr.) Chiu
Management of patients on the inpatient rehabilitation service under supervision. Initial medical and neurological work-up, setting of goals, and participation in rounds and team conferences. Outpatient work includes use of electromyography and the neuromuscular examination as diagnostic tools and management of common musculoskeletal conditions.

460 **Renal and Electrolyte Disorders** (arr.) Pierce
Participation in consultations, rounds, and outpatient clinic involving patients with renal and electrolyte abnormalities; follow-up of patients. Examination of the urinary sediment, peritoneum, and hemodialysis. Conferences, reading assignments, journal club. Washington Hospital Center.

461 **Renal Disease** (5) Bosch and Staff
Experience in clinical and laboratory procedures used in the study of renal disease. Ward rounds, consultations, conferences, seminars. University Hospital.

463 **Diagnostic Laboratory Immunology** (5) Phillips
Introduction to interpretation of the various laboratory assays used in clinical diagnostic immunology. Review of clinically applied immunology and its relationship to autoimmunity and immunologically mediated pathology. Clinical techniques for altering the course of immunological diseases, such as plasmapheresis. Tissue immunology as related to typing transplant patients.

465 **Renal Diseases and Fluid and Electrolyte Problems** (5) Jacobson
Participation in office and hospital consultations; care of patients with renal diseases and fluid and electrolyte problems. Familiarization with a variety of renal problems; work-ups of patients with renal disease; evaluation of renal function studies. Emphasis on critical use of medical literature.

469 **Renal Disease** (arr.) Shalhoub* and Staff
Participation in all clinical activities of the renal section, including consulta-

*Dr. Shalhoub is Chief of the Renal Section at the Veterans Administration Hospital.

tions, hemodialysis, outpatient clinic, rounds, conferences, and journal club meetings. V.A. Hospital.

471 **Allergy Clinic** (arr.) Summers
Lectures, conferences, and attendance at the allergy clinic, where both adult and child patients are seen. Detailed history taking, physical examination, and skin-testing techniques. Discussion of each case with an allergist to develop a complete management program. Emphasis on clinical aspects of immunology. Walter Reed Army Medical Center.

472 **Private Office Practice of Allergy** (3) Barr and Staff
Combined elective with allergy clinic at University Hospital and Children's Hospital.

492 **Emergency Medicine** (arr.) Hannon
Assignment in the emergency room, providing primary care under the direction of full-time physicians and medical and surgical residents. Emergent and nonemergent ambulatory problems, including medical, surgical, pediatric, psychiatric, trauma, and ob/gyn problems. Emergency therapy instituted prior to admission or discharge. Providence Hospital.

494 **Clinical Cancer Epidemiology** (arr.) Levine
Through the clinical epidemiology branch of NIH, students may participate in research and consultation in the clinical etiology of cancer, seeing patients with peculiarities in the occurrence of cancer that raise the possibility of detecting clues to the etiology of tumors; the application of computer technology to epidemiologic studies; or registry of rare tumors (investigating etiology of rare disorders, e.g., the American Burkitt Lymphoma Registry). Members of this branch participate in the genetics clinic, and students have opportunities for clinical contact while pursuing research and learning basic epidemiologic approaches. Useful for students considering preventive medicine, epidemiology, or public health as a career. National Institutes of Health.

495 **Oncology Review** (arr.) Hollinshead
Fundamentals, basic research, and latest clinical approaches. Student is assigned a reading list on one form of cancer and writes a review of his or her subject.

499 **Clinical Electrocardiography** (1) Rios
EKG interpretation. EKG diagnosis using the spacial vector approach of Dr. R.P. Grant. Diagnosis of arrythmias, cardiac pacing, holter EKG monitoring, and exercise electrocardiography. All members of the division of cardiology participate in at least one lecture.

501 **Immunopathogenesis of Human Disease** (3) Schulof
Review of recent advances in immunobiology and correlation with clinical manifestations and immunopathogenesis of selected human diseases. Lectures, group discussions, assigned readings, and required seminar presentation based on independent study.

502 **Issues in Clinical Nutrition** (3) Tziraki, Fromm, Walker
Analysis and evaluation of recent scientific data in the area of human nutrition. Topics include megavitamins, trace elements, food additives, fiber content, lipids, proteins, immunological responses, and nutrition as they influence health and disease. Daily didactic sessions; three seminars per week for discussion and analysis of assigned reading. Each student studies a specific area of interest and presents a written analysis of the scientific data.

503 **Clinical Physiology of Acid–Base and Electrolyte Disorders** (3) Kimmel
In-depth review of renal physiology as it relates to clinical medicine, with emphasis on water and electrolyte regulation as well as acid–base and electrolyte disorders. Daily didactic sessions; three seminars with problem-solving cases per week; homework exercises and assigned reading. Each student presents a written report on a clinical entity related to a selected fluid and electrolyte disorder.

**504 Topics in Clinical Toxicology and Occupational Medicine** (arr.) Welch
Clinical toxicology of occupational and environmental medicine. Didactic sessions and student-led seminars.

**505 Geographic Medicine and Tropical Disease** (arr.) Tuazon, James
Lectures, laboratory sessions (examination of various specimens for parasites), patient presentation and demonstration, and group discussion.

## Microbiology

*Chair:* L. F. Affronti

**128 Microbiology for New Health Practitioners (2)** Staff
Lecture course for students in health sciences programs. Basic concepts of microbiology and principles of microbial defense. Study of microorganisms of medical importance.

**129 Immunology: Introduction to Immunologic Fundamentals (3)** Affronti, Silver
Lecture course for medical technology students; open to others. Fundamental immunologic concepts. Serologic and immunologic procedures as applied to clinical and research situations. Prerequisite: introductory courses in microbiology and chemistry (inorganic and organic), or permission of instructor. (Spring)

**201 Medical Microbiology (8)** Staff
Required for medical students; open to qualified graduate students with permission. Bacteria, rickettsiae, viruses, yeasts, molds, protozoa, metazoa, and immunological concepts that relate to the health and disease of humans—cultural studies, methods of diagnosis, theories. (Spring)

**211 Microbiology (3)** Staff
For graduate students. Bacteria, viruses, rickettsiae, fungi, parasites, and immunological concepts. Prerequisite or concurrent registration: Bioc 221–22, or other biochemistry course, and permission of instructor. (Fall)

**212 Pathogenic Bacteriology (3)** Hugh
Principles of pathogenic bacteriology. Isolation and identification of bacterial agents that cause diseases in humans. Pathogenic characteristics of bacteria. Prevention and control of bacterial diseases in humans. Prerequisite: BiSc 111 or equivalent, Bioc 221–22. Laboratory fee, $20. (Spring)

**213 Bacterial Pathogenesis (3)** Hugh
Development of bacterial diseases in humans. Prerequisite: Micr 212 or equivalent. (Fall)

**214 Tissue Cell Culture (3)** Albright, Bradlaw
For graduate students. Fundamental aspects of tissue culture, with emphasis on mammalian cells. Specialized techniques and applications of cell culture procedures, emphasizing quality control practices. Prerequisite: Bioc 221–22. (Spring)

**215 Parasitology (2)** Turner
For graduate students; open to medical students. Study of host–parasite relationships. Clinical recognition of important parasites in medicine. (Fall)

**219 Scientific Writing (1)** Hugh
For graduate students. Provides basis for preparing theses, dissertations, and publications. (Fall)

**223 Antimicrobial Chemotherapy (1)** Reich
For medical students. Lecture course. Selection, clinical applications, and mechanism of action of various drugs and antibiotics used in the treatment of microbial infections. Prerequisite: Micr 201. (Fall)

225 **Microbial Physiology I** (3) Reich, De Giovanni-Donnelly
For graduate students. Microbial structure, nutrition, transport, growth, genetics, metabolism, and regulatory mechanisms. Prerequisite: Bioc 221–22. (Fall)

226 **Microbial Physiology II** (3) Reich, De Giovanni-Donnelly
For graduate students. Actions of antimicrobial agents and antibiotics on the structure and biochemistry of microorganisms at the cellular and molecular levels. Prerequisite: Micr 225 or permission of instructor. (Spring)

227 **Microbial Physiology Laboratory** (2) Reich
For graduate students. Application of laboratory techniques and instrumentation to topics covered in Micr 225 and 226. Prerequisite: Micr 226. Laboratory fee, $20. (Fall)

229 **Immunology** (3) Kind, Affronti
For graduate students. Lecture course. Fundamental immunologic concepts. Antigens, antibodies, antigen and antibody reactions *in vitro* and *in vivo*, and the immune response. Prerequisite: Bioc 221–22.

230 **Immunology Laboratory** (2) Kind, Affronti
Methods in serology, immunochemistry, and cellular immunology that are used in research laboratories. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Limited to students enrolled in the microbiology graduate program. Laboratory fee, $20. (Fall, odd years)

231 **Immunobiology** (1) Affronti, Kind
For medical students; open to graduate students. Lecture course. Study of immunological functions of reticuloendothelial tissues, theories of autoimmunity, graft rejection, tumor immunity, delayed hypersensitivities, and immunogenetics. Prerequisite: Micr 201 or 229 and permission of instructor. (Fall)

233 **Virology** (3) Stokes
For graduate students. Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Bioc 221–22 or permission of instructor. (Fall)

234 **Virology Laboratory** (2) Stokes
For graduate students. Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee, $20. (Fall)

235 **Systematic Bacteriology** (2) Hugh
For graduate students. History of bacterial classification, international rules of bacterial nomenclature, development of bacterial classification based on relationships, characteristics of bacterial groups. Prerequisite: Micr 201 or 212 or equivalent. (Fall, odd years)

250 **Pathogenesis of Microbial Infections** (1) Hugh
For medical students; open to graduate students. Physiological, anatomical, pathological, genetic, and biochemical bases for the pathogenesis of selected bacterial, mycotic, viral, and parasitic infections in humans. Host and agent factors that specifically influence resistance to infection. Prerequisite: Micr 201 or 212 and 213.

252 **Medical Parasitology** (1) Turner
For medical students; open to graduate students. Lecture and laboratory course. Life cycles, epidemiology, manifestations, pathology, diagnosis, treatment, and prevention of medically important protozoan and helminthic infections. Laboratory emphasizes recognition and identification of the etiologic agents causing disease through the study of living and preserved specimens. (Fall)

255 **Clinical Virology** (1) Staff
Elective course for medical students; open to graduate students. General principles of virology, with emphasis on clinical situations. Prerequisite: Micr 201 or equivalent. (Fall)

**257 Experimental Immunochemistry (3)** Affront
For graduate students. Biochemical and physiochemical characterization o antigens and antibodies. Prerequisite: Bioc 221–22 or equivalent, Micr 22 Laboratory fee for nonmedical students, $20. Limited enrollment. (Spring, even years)

**258 Microbial Genetics (2)** De Giovanni-Donnell
For graduate students. Survey of microbial systems that depict basic concept of genetic principles. (Spring)

**260 Cellular Immunology (1)** Kind
For graduate students. Advanced seminars in cellular aspects of the immune response. Content differs each time course is offered. May be repeated for credit. Prerequisite: Micr 229. (Spring)

**277–78 Seminar: Microbiology (1–1)** Staff
Required of graduate students. (Academic year)

**281 Biological Basis of Infections (arr.)** Affronti
Selected problems; readings, laboratory studies, term paper.

**282 Immunology (5)** Affronti and Staf
Selected problems in immunology. Library assignments, laboratory research and term paper.

**290–91 Extramural Microbiology Elective (arr.)** Staf
Elective periods at other institutions.

**293 Special Topics in Microbiology (arr.)** Staf
May be repeated for credit. (Fall and spring)

**295 Research in Microbiology (arr.)** Staf
Content differs each time course is given. May be repeated for credit. (Fall and spring)

**299–300 Thesis Research (3–3)** Staf
(Fall and spring)

**398 Advanced Reading and Research (arr.)** Staf
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

**399 Dissertation Research (arr.)** Affronti
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

**800 Summer Remedial: Microbiology (8)**

## Neurological Surgery

*Chair:* E. R. Laws

**302 Clinical Clerkship in Neurosurgery (3)** Laws
Introduction to neurosurgery, emphasizing the neurological examination, diagnosis, and rudiments of treatment. Fulfills the neuroscience course requirement. University Hospital.

**380 Neurosurgery (5)** Laws
Clinical clerkship in neurosurgical service, emphasizing neurologic examination and indications for special neurologic and operative procedures. Medical Faculty Associates and University Hospital.

**382 Neurosurgery (5)** Harris, Pulliam
Participation in all departmental activities: ward rounds, daily conferences, radiographic and pathologic studies, and operating room procedures. National Naval Medical Center.

**383 Pediatric Neurosurgery (arr.)** McCullough and Staf
Participation in all departmental activities: ward rounds, daily conferences, radiographic studies, and operating room procedures. Children's Hospital.

387 **Neurosurgery** (arr.) Cooney
Participation in all departmental activities: ward rounds, daily conferences, radiographic studies, and operating room procedures. Washington Hospital Center.

390–92 **Extramural Neurosurgery Elective** (arr.)
Elective periods at other institutions.

## Neurology

*Chair:* G. F. Molinari

380 **Neurology** (arr.) Molinari and Staff
Expertise in performing the neurological examination taught through work-up of new hospital and clinical patients, with emphasis on the anatomical localization of neurological symptomatology. Introduction to differential diagnosis. Familiarization with indications for neurological procedures (CT scanning, arteriography, myelography, evoked potentials, and EEG). Lecture series reviews the basic categories of neurological diseases.

383 **Neurology** (5) Gunderson
Development of proficiency in assessing common neurologic problems through mastery of the routine neurologic history and physical examination, use of laboratory aids, and application of neuroanatomy to clinical problem solving. Treatment of common neurology problems. Walter Reed Army Medical Center.

384 **Neurology** (arr.) Laureno
Clerkship in neurology. Participation in neurology consultation service, clinic, and seminars. In-depth research for formal seminar presentation. Washington Hospital Center.

390–94 **Extramural Neurology Elective** (arr.)
Elective periods at other institutions.

395 **Neurology Research** (arr.) Laureno
Participation in ongoing research in nutritional deficiency, toxins, and fluid–electrolyte derangements and their effects on brain and muscle. Washington Hospital Center.

## Obstetrics and Gynecology

*Chair:* A. B. Weingold

303 **Clinical Obstetrics and Gynecology** (10) Davis
Required for medical students. Participation in all obstetrical and gynecological clinics, daily departmental conferences, and ward rounds. Eight-week periods throughout the academic year. University, Fairfax, and Holy Cross Hospitals.

376 **Gynecologic Oncology** (5) McGowan
Experience in clinical inpatient and office diagnosis and treatment of women with gynecologic cancer. Medical Faculty Associates.

377 **Cytogenetics and Prenatal Diagnosis of Birth Defects** (arr.) Larsen
Study of cytogenetics and participation in genetic counseling, amniocentesis, and laboratory evaluation of amniotic fluid. Interpretation and preparation of chromosome karyotype.

378 **Reproductive Endocrinology and Infertility** (arr.) Stillman
Experience in management of patients with gynecologic endocrine and infertility problems. Infertility work-up and operative diagnostic and therapeutic procedures, including *in vitro* fertilization/embryo transfer.

380 **Clinical Obstetrics and Gynecology** (arr.) Gahres, Radice
Participation in patient care, clinics, surgery, delivery. Alexandria Hospital.

381 **Perinatal Medicine** (arr.) Isada
Experience in high-risk obstetrics clinics and antepartum and intrapartum management of high-risk and normal obstetrical patients. Participation with Fellows in maternal–fetal medicine at the University Hospital and outlying hospitals. Required paper.

383 **Clinical Gynecology** (arr.) Footer
Participation in office practice of gynecology.

384 **Clinical Obstetrics and Gynecology Surgery** (3) Schneiderman and Staff
Gynecology, obstetrics, and infertility evaluation in office practice. Care of hospitalized patients. Delivery and surgery.

390–95 **Extramural Obstetrics and Gynecology Elective** (arr.)
Elective periods at other institutions.

501 **Didactic Reproductive Biology** (3) Isada
Intensive interdisciplinary course. Lectures, labs, reading, and seminars reviewing basic anatomy, histology, embryology, and pathology of the female reproductive tract in the context of clinical obstetrics and gynecology. Required paper.

## Ophthalmology

*Chair:* M. F. Armaly

381 **Clinical Ophthalmology** (arr.) Armaly and Staff
Examination, diagnosis, and management of a wide variety of ocular conditions in ambulatory patients. Emphasis on conducting a general ophthalmic examination, recognition of abnormal findings, and management of common ocular diseases. Lectures, rounds, and seminars. Medical Faculty Associates.

382 **Clinical Ophthalmology** (arr.) Sawyer
Examination, diagnosis, and management of a wide variety of ocular conditions. Emphasis on conducting a general ophthalmic examination, recognition of abnormal findings, and management of common ocular diseases. Lectures, rounds, and seminars. National Naval Medical Center.

383 **Clinical Ophthalmology** (3) Ibrahim and Staff
Examination techniques, management decisions, follow-up, and outcome of clinical entities. Observation, demonstration, and discussion with the clinical faculty. Group Health Association.

390–92 **Extramural Ophthalmology Elective** (arr.)
Elective periods at other institutions.

## Orthopaedic Surgery

*Chair:* R. N. Nevasier

302 **Clerkship in Orthopaedic Surgery** (3) Labropoulos and Staff
Basic clinical rotation. Didactic sessions on physical diagnosis, X-ray interpretation, arthritis, trauma, and reconstructive surgery. Ward rounds, periods in emergency room or operating room, conferences. Night call is generally required. All affiliated hospitals.

380 **Orthopaedic Surgery** (5) Wiesel
Students participate in care of orthopaedic inpatients and outpatients, daily rounds, and conferences under the direction of a faculty member. Prerequisite: Orth 302. University Hospital and affiliated hospitals.

383 **Sports Medicine** (5) **Haas and Staff**
Introduction to athletic injuries, including prevention and management. Prerequisite: Orth 302.

384 **Sports Medicine for Children** (5) **Reff**
Diagnostic and treatment methods of outpatient orthopaedic sports medicine for children. Surgical treatment of sports injuries, pediatric orthopaedics, clinical research. Children's Hospital.

390–93 **Extramural Orthopaedic Surgery** (arr.) **Labropoulos**
Elective periods at other institutions. Prerequisite: Orth 302.

501 **Foundations of Orthopaedic Knowledge** (3) **Hurwitz**
Orthopaedic biomechanics, form and function of the musculoskeletal system, concepts and terminology of basic science for clinical research.

## Pathology

*Chair:* H. Sidransky
*Directors of Divisions:* S. G. Silverberg *(Anatomical Pathology)*, D. S. Wilkinson *(Clinical Pathology)*

Courses numbered 13 to 20 are open only to military personnel in the medical laboratory technique program.

13 **Hematology** (6) **Staff**
Basic hematologic procedures, diagnosis of abnormalities of cellular elements of blood and bone marrow, studies in blood coagulation, quality control in clinical hematology.

14 **Blood Banking** (6) **Staff**
Principles of immunohematology, blood donor center techniques, blood processing techniques, quality control in blood banking.

15 **Clinical Laboratory Rotation** (14) **Staff**
Instruction in laboratory technique, stressing the application of theories and principles of clinical chemistry, microbiology, hematology, and blood banking in the clinical laboratory.

16 **Clinical Chemistry** (5) **Staff**
Principles and techniques of blood chemistry analyses, including toxicological analyses for drugs of abuse and environmental poisons.

17 **Urinalysis** (2) **Staff**
Principles and techniques of urine chemistry and microscopic analysis.

18 **Bacteriology** (6) **Staff**
Identification of pathogenic microorganisms by morphologic and cultural techniques.

19 **Parasitology** (4) **Staff**
Identification of human parasites and their life cycles. Concentration methods, staining techniques, and media for culture.

20 **Serology** (2) **Staff**
Principles and techniques of antigen–antibody reaction and immunological responses.

Courses numbered 121 to 126, 130 to 133, and 140 are open only to students in the clinical year of the medical technology program.

121 **Introduction to Medical Technology** (4) **Silver, Smith**
Orientation to laboratory medicine. Clinical chemistry, hematology, microbiology, and immunohematology. Lecture and laboratory. Path 121 is prerequisite to all other courses in the clinical year of the medical technology program. (Fall)

122 **Clinical Chemistry** (3) Staff
Lecture course in the principles and procedures involved in chemistry analysis of human blood and body fluids. Clinical correlations and pathological aspects of human disease. Prerequisite: Path 121.

123 **Clinical Microbiology** (2) Silver
Lecture course in clinical microbiology, with emphasis on pathogenic characteristics, isolation, and identification of organisms related to human disease. Prerequisite: Path 121.

124 **Immunohematology** (1) Silver and Staff
Lecture course in immunological aspects of transfusion of human blood. Emphasis on preparation and administration of blood components. Prerequisite: Path 121.

125 **Clinical Hematology and Coagulation** (2) Smith
Lecture course in the laboratory detection, clinical correlation, and pathophysiology of human blood cell diseases and coagulation disorders. Prerequisite: Path 121.

126 **Special Topics in Laboratory Medicine** (2) Staff
Principles of clinical parasitology, mycology, serology, laboratory management, and education techniques. Prerequisite: Path 121.

127–28 **Pathology for New Health Practitioners** (2–2) Staff
Lecture course with optional laboratory. Basic concepts and language of pathology; infectious diseases and fundamental disease processes. Emphasis on pathogenesis and dynamics of disease. Causation, evolution, and morphology of pathological changes in the principal diseases of each organ system, presented in coordination with clinical lectures in Idis 301.
(Academic year)

130 **Clinical Chemistry Practicum** (4) Silver
Rotation through the University Hospital clinical chemistry laboratory. Prerequisite: Path 121.

131 **Clinical Microbiology Practicum** (4) Silver
Rotation through the University Hospital clinical microbiology, mycology, virology, and parasitology laboratories. Prerequisite: Path 121.

132 **Hematology/Coagulation Practicum** (4) Silver
Rotation through the University Hospital clinical hematology and coagulation laboratories. Prerequisite: Path 121.

133 **Blood Bank/Serology/Urinalysis Practicum** (4) Silver
Rotation through the University Hospital blood bank, serology, and urinalysis laboratories. Prerequisite: Path 121.

140 **Independent Study in Medical Technology** (arr.) Staff
Intensive review of medical technology, with assigned readings and participation in selected courses in the medical technology program. Registration by petition.

152 **Introduction to Basic Laboratory Medicine** (2) Smith
Theory, performance, and interpretation of routine clinical laboratory tests done in a physician's office, such as complete blood counts with differentials, staining and reading smears, urinalysis and microbiological culture and staining techniques, and organism identification. Lectures, demonstrations, audiovisuals, and laboratory. Prerequisite: Path 127–28.
(Summer)

201 **Pathology** (8) Kent and Staff
A year-long course; required for second-year medical students. General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies.

203–4 **Pathology (4–4)** Kent and Staff
For graduate students. General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path 203: Anat 202, 203, 204, 205; or equivalent. Prerequisite to Path 204: Path 203. (Academic year)

217 **Gross Autopsy Pathology (1)** Orenstein and Staff
Review of current necropsy cases, with emphasis on the correlation of gross changes in the organs and the clinical history. Limited to second-year medical students. University Hospital. (Spring)

220 **Medical Mycology (2–4)** Al-Doory
Lecture and laboratory course covering pathogenic fungi, mycotic diseases, and their clinical aspects. (Fall)

222 **Opportunistic Mycoses (2)** Al-Doory
Study of the opportunistic fungal infections and their serological, clinical, and therapeutic aspects. Emphasis on identification of fungi and evaluation of laboratory findings. (Spring)

256 **Pathology of Infectious Diseases (3)** Abraham
For graduate students. Correlation of clinical, physiological, immunologic, and pathological mechanisms determining the course and morphological changes that occur in infections. Analysis of cases and review of assigned readings. Prerequisite: Micr 211, Path 203.

257 **Transmission Electron Microscopy in Pathologic Diagnosis (3)** Orenstein, Abraham
For graduate students. Techniques for the examination and interpretation of ultrastructural changes associated with human disease states. Emphasis on transmission electron microscopy as a diagnostic tool. Prerequisite: Path 203, 204; Anat 260, 261.

258 **Organ System Pathology (5)** Bloom
For graduate students. Gross and microscopic study of human pathological material reflecting major diseases of specific organ systems. The organ systems studied will be rotated annually, depending on demand. Organ systems to be covered include cardiovascular, digestive, nervous, renal, reproductive, and respiratory. Prerequisite: Path 203, 204, and permission of instructor. (Fall and spring)

261 **Seminar in Experimental Pathology (1)** Sidransky
Current topics in research in experimental pathology. Limited to second-year medical students. (Spring)

266 **Comparative Pathology I (1)** Zook
Participation in an autopsy service involving captive wild animals. Comparison of diseases in various animal species with those in humans. Limited to second-year medical students. Pathology Laboratory, National Zoological Park. (Spring)

270 **Medical Mycology (1)** Al-Doory
Review of major mycotic diseases, with emphasis on opportunistic mycoses. Limited to second-year medical students.

284 **Ophthalmic Pathology (arr.)** McLean and Staff
Participation in an active service limited to pathology of the eye and its adnexa, particularly inflammatory, degenerative, and neoplastic diseases. Armed Forces Institute of Pathology.

286 **Perinatal Pathology (arr.)** Kent
Focuses on important disorders that may beset the human fetus and the newborn infant. Emphasis on the role of placental abnormalities. Prerequisite: Path 203, 204, and permission of instructor. (Spring)

289 **Clinical and Anatomical Pathology (arr.)** Cook and Staff
Designed to familiarize the student with the operation of the pathology

department in a community hospital. Student may elect to concentrate in a specialized area or to study only anatomic pathology. A nuclear medicine elective is also available. Fairfax Hospital.

290–92 **Extramural Pathology Elective** (arr.)
Elective periods at other institutions.

296 **Surgical Pathology** (arr.) Silverberg and Staff
Evaluation of surgical specimens and correlation with clinical status of patient. Description of gross and microscopic findings on assigned cases. University Hospital.

298 **Autopsy Pathology** (arr.) Orenstein, Kent
Organ changes in disease, gross and microscopic correlation, preparation of protocols. Participation in autopsy pathology service. University Hospital Staff

299–300 **Thesis Research** (3–3)
(Fall and spring)

301 **Clinical and Anatomical Pathology** (arr.) B. Smith and Staff
Opportunity to explore in depth a topic selected from the field of pathology. Assigned readings. V.A. Hospital. Kim

302 **Forensic Pathology** (arr.)
Participation in the activities of the office of the Chief Medical Examiner of the District of Columbia. Observation of death scene investigation techniques, medical–legal autopsies, and related toxicological laboratory analyses; attendance at court trials; and participation in the various conference activities of the agency. Staff

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring) Staff

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

501 **Selected Topics in Pathology** (3) Kent and Staff
Guided readings, study, and/or laboratory experience in an aspect of pathology of particular interest to students. Students present a report on the specific topic. Kent

800 **Summer Remedial: Pathology** (8)

## Pharmacology

*Chair:* H. G. Mandel

110–11 **Pharmacological Basis of Anesthesia** (4–4) Mazel and Staff
For students in nursing anesthesia. Principles of pharmacology; drugs affecting the autonomic nervous system, central nervous system, and cardiovascular system; fundamentals of inhalation anesthesia; auxiliary drugs used in anesthesiology; endocrines, cancer chemotherapy; other topics.
(Academic year)

114 **Drugs and the Consumer** (3) Cohn and Staff
General concepts of drug action in the body. Action mechanism of some specific prescription and nonprescription drugs, including contraceptives, tranquilizers and sleep-inducing drugs; hay fever, headache, and cold remedies; analgesics; antibiotics; vitamins. Issues related to development and marketing of drugs, drug safety, drug advertising, generic versus trade-name drugs, drug use in sports, drug use during pregnancy, smoking and health. Limited enrollment. (Fall)

115 **Nonmedical Use of Licit and Illicit Drugs** (3) Cohn and Staff
Psychological and sociological bases of recreational and other nonmedical use

of drugs, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems, legal and societal implications of and reactions to the nonmedical use of drugs, and prevention and treatment of drug dependence. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana, and hallucinogenic and psychedelic drugs. (Spring)

120 **Readings in Pharmacology for Anesthesia** (arr.) Mazel and Staff
For students in nursing anesthesia. Assigned readings in anesthesia and related areas; preparation of reports.

124–25 **Chemistry and Physics of Anesthesia** (3–3) Mazel and Staff
For students in nursing anesthesia. Basic concepts of physics, general chemistry, organic chemistry, biochemistry, and their application to medicine and anesthesiology, including chemistry of respiration, acid–base balance, clinical biochemistry and enzymology, hormones, radioisotopes, electronics, and physiochemical properties of anesthetic agents. (Academic year)

130 **Seminar: Accessory Drugs in Anesthesia** (2) Mazel and Staff
For students in nursing anesthesia. Pharmacology and pharmacodynamics of accessory anesthetic drugs, with emphasis on those areas not covered in Phar 110–11.

158 **Pharmacology for New Health Practitioners** (4) Straw and Staff
Drug disposition. Autonomic nervous system, cardiovascular, and gastrointestinal drugs. Psychopharmacology. Analgesics, sedatives, anticonvulsants. Chemotherapy, toxicology, endocrinology. Prerequisite: Anat 115, Phyl 111; or equivalent.

159 **Introduction to Pharmacology I** (3) Straw
For part-time students in health sciences programs. Includes all topics covered in Phar 158 except gastrointestinal drugs, anticonvulsants, and endocrinology. Students who receive credit for Phar 158 may not receive credit for Phar 159 or 160. Prerequisite: Anat 115, Phyl 111, and permission of instructor. (Spring)

160 **Introduction to Pharmacology II** (1) Straw
Continuation of Phar 159 for part-time students in health sciences programs. Gastrointestinal drugs, anticonvulsants, and endocrinology. Students who receive credit for Phar 158 may not receive credit for Phar 159 or 160. Prerequisite: Phar 159 and permission of instructor. (Spring)

191 **Respiratory Care** (3) Mazel and Staff
For students in nursing anesthesia. Advanced techniques for care of patients requiring total respiratory support. Same as Anes 191.

201–2 **Pharmacology** (6–2) Mandel and Staff
Required for second-year medical students. Lectures, laboratory, and conferences on interaction of drugs and biological systems as a basis for rational disease therapy. Prerequisite: Bioc 201; Phyl 201, 212.

203 **Fundamental Principles of Pharmacology and Toxicology** (3) Cohn and Staff
For graduate students. Basic principles of pharmacology, including drug–receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms; mechanisms of mutagenesis, carcinogenesis, teratogenesis, and specific organ toxicity; risk assessment and extrapolation. Admission by permission of instructor. (Fall)

205 **Pharmacology** (8) Cohn and Staff
For graduate students. Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis for rational disease therapy. Prerequisite: Phar 203, courses in biochemistry and physiology, or approval of department. (Fall)

207 **Pharmacology for New Health Practitioners** (4) Straw and Staff
Same as Phar 158, but with additional course requirements. Primarily for

students in the graduate program in primary care nursing offered in collaboration with George Mason University. Staff

220 **Molecular Events in Toxic Actions** (2)
For graduate students. Metabolism of xenobiotics to cytotoxic products. Environmental and genetic factors influencing toxic actions. Molecular mechanisms of toxicity. Prerequisite: Phar 203. (Spring) Staff

222 **Genetic Toxicology** (2)
For graduate students. Action of chemicals and radiation in the induction of DNA damage and repair *in vitro* and *in vivo* and the sequelae of these processes in cells and mammals. DNA repair mechanisms, mammalian cell toxicity, mutagenesis, and carcinogenesis. Prerequisite: Bioc 221–22. (Spring) Staff

230 **Special Topics in Toxicology** (arr.)
For graduate students. Selected aspects of toxicology. Content differs each time course is offered. May be repeated for credit. (Fall and spring) Klubes

254 **Frontiers in Pharmacology** (1)
For medical and graduate students. Recent advances and research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)

258 **Cancer Chemotherapy** (1) Mandel and Staff
For medical and graduate students. Seminars and lectures by scientists involved in current research on cancer and cancer chemotherapy. (Spring, even years)

259 **Readings: Cancer and Cancer Chemotherapy** (2) Barrows and Staff
For medical and graduate students. Selected readings and discussion of recent advances in cancer and cancer chemotherapy research. Prerequisite: Phar 201 or 205. (Spring, odd years) Staff

260 **Endocrine Pharmacology** (1)
For medical and graduate students. Lectures and seminars on recent advances in the pharmacology and mechanism of action of various hormones. (Spring, odd years) Mandel and Staff

269 **Pharmacology Seminar** (1)
For graduate students. Recent advances in pharmacology. Content differs each time the course is offered. May be repeated once for credit. (Fall) Cohn

272 **Physiological Disposition of Drugs** (3)
Mechanisms for the absorption, distribution, metabolism, and excretion of drugs and the physical, chemical, and biological factors affecting these processes are studied through extensive reading of classical and current literature. Prerequisite: Bioc 221–22, Phar 203, or permission of instructor. (Spring) Abramson and Staff

273 **Pharmacokinetics: Principles and Applications** (2)
For graduate students. Description of compartmental and physiological models of drug disposition. Problem solving to obtain rate constants, organ clearances, etc., from experimental data. Examples of drug disposition exemplifying various pharmacokinetic approaches. (Spring) Cohn and Staff

275–76 **Advanced Topics in Pharmacology and Toxicology I–II** (1–1)
For graduate students. Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, laboratory techniques. (Alternate academic years) Cohn and Staff

277–78 **Advanced Topics in Pharmacology and Toxicology III–IV** (1–1)
For graduate students. Continuation of Phar 275–76. (Alternate academic years)

279 **Special Topics in Pharmacology** (arr.) Staff
For graduate students. Selected aspects of drug action. Content differs each time the course is offered. May be repeated once for credit. (Fall and spring)

280 **Neuropharmacology** (2) Valentino, Perry
For graduate students. Fundamental principles. Electrophysiological and biochemical techniques. Neurotransmitters and their pathways in the central nervous system. Drug effects on neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Phar 205 or equivalent. (Spring)

285 **Readings in Pharmacology** (arr.) Mandel
Assigned reading and preparation of reports.

286 **Research in Pharmacology** (arr.) Mandel
For medical students. Participation in experimental studies in pharmacology, particularly neuropharmacology, cancer chemotherapy, or drug metabolism. (Fall and spring)

287 **Readings in Drug Abuse Literature** (arr.) Cohn
Professional and nonprofessional literature on drug dependence. Informal luncheon discussions or assigned reading and preparation of a report. (Spring)

290–91 **Extramural Pharmacology Elective** (arr.)
Elective periods at other institutions.

295 **Reading and Research** (arr.) Staff
May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

501 **Readings in Pharmacology** (arr.) Staff
Readings, discussions, and/or preparation of report. Student can choose to work with one or more faculty members in the department on a topic of mutual interest. (Fall and spring)

502 **Clinical Use of Drugs** (3) Mandel and Staff
Discussion of the rational use of drugs in the treatment of disease. Independent reading and study. (Spring)

503 **Drug Dependence: Basic and Clinical Aspects** (3) Cohn and Staff
Seminars and discussion on various aspects of drug and chemical dependencies, such as recognition and diagnosis of dependence; the role of drugs in treating dependence; fetal alcohol syndrome and the addicted neonate; recent research on marijuana, cocaine, PCP, and other drugs; and treatment of the drug overdose emergency. Independent reading and study.

800 **Summer Remedial: Pharmacology I** (6) Mandel

801 **Summer Remedial: Pharmacology II** (2) Mandel

## Physiology

*Chair:* R. A. Kenney

***Departmental Prerequisite:*** Phyl 201 or equivalent is prerequisite to all courses numbered above 201, except Phyl 205, 212, and 221.

111 **Physiology for New Health Practitioners** (4)
For students in physician assistant, nurse practitioner, and nursing anesthesia programs. Function and process of the human body, covering the major organ systems.

191 **Selected Topics in Human Structure and Function** (3)
Structural and functional basis of physiology. Required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11–12 or equivalent and consent of instructor. Open to Columbian College students with approval of advisor. (Fall)

201 **Physiology** (8)
Required for medical students, open to graduate students. Cellular, organ system, and applied human physiology. Prerequisite for graduate students: Anat 201 or Phyl 191, or equivalent; Bioc 221 or Phyl 205, or consent of department chair. Concurrent registration: Phyl 212. Open to consortium students only with permission of department chair. (Spring)

205 **Cell Biophysics** (2) Cassidy, Kuranstin-Mill
For graduate students. Introductory survey of the mechanisms for interconversion and utilization of energy in animal cells. Required for graduate students intending to take Phyl 201. Prerequisite: BiSc 11–12 or equivalent and consent of instructor. (Fall)

212 **Neurobiology** (3)
For graduate students. Same as Anat/Idis 212. Integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory. Laboratory fee, $25. (Spring)

221 **Seminar** (1)
For graduate students. Staff and student presentations from literature. Present work discussed; experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered. May be repeated for credit. (Fall and spring)

253 **Physiology of Fluid Balance and Hydrogen Ion Regulation** (2)
Discussion of principles of fluid and acid–base balance and their applications. (Fall)

262 **Topics in Cardiovascular Physiology** (2)
Survey, at an advanced level, of aspects of cardiovascular physiology, especially as interrelated with the respiratory and renal systems.

269 **Topics in Neurophysiology and Psychophysiology** (2)
Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior, and sensory processing. Admission by permission of instructor. (Fall)

282 **Experimental Physiology** (arr.)
Participation in an ongoing research program in the department. Programs currently available in membrane physiology, intestinal transport, neurophysiology, and cardiovascular physiology.

290–91 **Extramural Physiology Elective** (arr.)
Elective periods at other institutions.

295 **Research** (arr.)
By special arrangement with individual staff members. Approximately four hours per week in the laboratory for each semester hour of credit. May be repeated for credit. (Fall and spring)

298 **Comprehensive Physiology** (arr.)
Guided review of selected areas of physiology appropriate to the student's graduate program. Prerequisite or concurrent registration: Phyl 221. (Fall)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

396 **Advanced Reading and Research** (2) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. Tutorial literature survey of a subfield of physiology and of pertinent areas of the candidate's field. This course satisfies the requirement for Part II of the Cumulative General Examination in physiology. (Fall and spring)

397 **Development of Dissertation Problem** (2) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. Preparation for written and oral presentation of dissertation problem. This course satisfies the requirement for Part III of the Cumulative General Examination in physiology. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

501 **Physiology of Aging** (3) **Kenney**
Guided reading and discussion on the normal process of aging.

502 **Structural–Functional Correlations in GI Disease** (arr.) Cassidy
Morphological methodology, technique in the diagnosis and prognostic evaluation of gastrointestinal disease states such as ulceration, colitis, Hirschprungs disease, colorectal carcinoma, and pancreatic malfunction. Techniques considered include traditional light microscopy, scanning and transmission electron microscopy, and immunocytochemistry. Selected readings and discussion.

503 **Advanced Physiology** (arr.) **Kenney**
Guided readings, study, and/or laboratory experience at an advanced level in a subfield of physiology.

800 **Summer Remedial: Physiology** (8) **Staff**

## Psychiatry and Behavioral Sciences

*Chair:* J. M. Wiener

All clinical courses carry 5 semester hours of credit per four-week period.

210 **Death and Dying** (1) **Perlin, Akman**
Consideration of issues related to death and dying, including care and assessment of the terminally ill, hospice care, rights of the dying patient, suicide, and survivorship and bereavement. Special section on AIDS.

211 **Introduction to Clinical Psychiatry** (2) Sanders and Staff
In-depth study of topics in psychiatry of interest to students. Students meet with faculty to discuss readings and research and, on occasion, interview patients in the hospital. Topics regularly include psychoanalysis, eating disorders, consultation liaison, death and dying, and child psychiatry.

212 **Application of Psychoanalytic Principles to the Practice of Medicine** (1) **Staff**
Special course designed for medical students by the extension division of the Washington Psychoanalytic Institute, taught by a practicing psychoanalyst.

213 **Identity and Role of the Physician** (1) Robinowitz
Didactic material combined with experimental models, including group dynamics. Emphasis on issues of concern to women.

215 **Individual Student Preceptorship** (1) Wiener and Staff
First- and second-year medical students may arrange individual preceptorships other than those listed, with permission of department chair.

252 **Biopsychosocial Model in Medical Practice** (3) Walsh and Sta
Required for medical students. Basic principles of the doctor–patient relatio
ship. Analysis of psychological growth and development, family process, a
the personality of the physician as they influence everyday medical practic

301 **Psychopathology and Conceptual Models** (2) Sanders and Sta
Required for second-year medical students. Mental mechanisms, psych
pathology, introduction to psychiatric syndromes, clinical interviewing, a
behavioral sciences in clinical medicine. (Fall)

302 **Clinical Clerkship** (10) Akman and Sta
Required for medical students. Supervised examination, diagnosis, and ou
patient and inpatient treatment at University, St. Elizabeths, Children's, a
V.A. Hospitals, Northern Virginia Mental Health Institute, and Psychiatri
Institute of Washington. Case conferences, seminars on psychiatric referra
"psychiatric" drugs, and community resources, with emphasis on psychiatr
in general practice. (Fall and spring) Staf

381 **Clinical Psychiatry** (arr.)
Participation as acting intern in one or more of the psychiatry services o
GWU Medical Center: inpatient and emergency, outpatient, consultatio
liaison, and oncology liaison. Assignments are based on student preferenc
possible. A rotation of at least eight weeks is preferable for supervise
psychotherapy experience; four-week elective emphasizes diagnostic asses
ment and briefer treatment modalities.

383 **Consultation Liaison** (arr.) Frankel, Perl
An individualized program on the consultation liaison service, with emphas
on psychosocial factors affecting the onset, manifestations, and treatment o
medical illness. Issues of death and dying. Involvement in the consultatio
process, conferences, liaison meetings, individual supervision of clinical work
and directed readings.

386 **Research and Clinical Approaches to Families of Medical Patients** (arr.) Steinglass and Staf
Introduction to theory, method, and techniques of clinical and research
evaluation of families of medical patients, with emphasis on family factors
that favor or retard the patient's recovery from serious medical illness.
Completion, under supervision, of a small independent project on a topic o
student's choice. Egan and Staf

388 **Child and Adolescent Psychiatry** (arr.)
Experience as an acting intern in child psychiatry. Consultation to pediatric
wards, outpatient evaluation and treatment of selected patients and their
families, and/or inpatient child and adolescent services; eight weeks required
for specialized experience in all three areas. Individualized program by
arrangement. When possible, assignments are based on student's preference
and prior experience. Children's Hospital.

390–93 **Extramural Psychiatry Elective** (arr.)
Elective periods at other institutions.

397 **Schizophrenic and Borderline Conditions** (5) Fenton, Williams
Participation in and study of treatment and administrative management of
patients. Participation in staff meetings. Individual supervision and selected
readings. Chestnut Lodge, Rockville, Maryland.

406 **Psychiatric Education, Research, and Administration** (arr.) Robinowitz and Staf
Student preceptorship: practicum experience, instruction in theory, participa
tion in research, and individual project. Direct supervision by and close
working contact with director and staff of office of education of national
specialty society. Individualized program in areas such as women in medi
cine, psychiatric education, manpower development relevant to health care
delivery, continuing education, federal and legislative affairs, health plan
ning, and relation of medical education to practice.

**109 Independent Study (arr.)** Wiener
Individualized study, clinical training, or research experience selected on the basis of the student's interests and available resources. Topics may include death and dying, suicide, medical ethics, depression, or other issues in psychiatry and behavioral science. Must be arranged prior to registration.

**800 Summer Remedial: Medical Practice (3)** Wiener

**801 Summer Remedial: Conceptual Models (2)** Wiener

## Public Health

Public health courses are open only to students in the M.P.H. program or with permission of the M.P.H. program director.

**201 Epidemiology and Preventive Medicine (3)** Cawley and Staff
Principles of epidemiology and preventive medicine, including rates of disease, principles of screening, and descriptive epidemiology. Population dynamics and special populations, including consideration of maternal and child health and geriatrics. Applications to infectious and chronic diseases and to environmental and occupational health. (Fall)

**202 Biostatistical Applications for Public Health (3)** Hirsch, Riegelman
Application of biostatistical principles to critical analysis of retrospective and prospective studies, controlled clinical trials, and reports in the health services literature. Selection, basic calculations, and interpretation of statistical methods. (Fall)

**205 Health and Society (2)** Moreno and Staff
Issues related to the health of the public considered from the viewpoints of economics, law, political science, sociology, history, and biomedical ethics. (Summer)

**206 Colloquium in Health Policy (1)** Moreno and Staff
Seminars and lectures by experts in health policy. Content changes each year. (Spring)

**211 Economics of Health Care (3)** Greenberg and Staff
Principles of microeconomics applied to health care delivery and health policy, including discussion of incentive systems, markets and competition, regulation, and the economics of health care technology. Same as HSA 262. (Fall and summer)

**213 Administration of Health Systems (3)** Crum and Staff
Application of management and organization theory to issues of health services delivery, institutional leadership and governance, and management of conflict and change. Same as HSA 260. (Fall and summer)

**214 Health Planning and Marketing (3)** Reeves and Staff
Strategic planning, marketing, policy analysis, and evaluation techniques for health care delivery services. Prerequisite: PubH 213. Same as HSA 264. (Spring)

**220 Decision Making in Clinical Epidemiology and Public Health (2)** D'Angelo and Staff
Quantitative and qualitative approaches to decision making. Decision analysis and cost-effectiveness analysis. Survey design methods. Applications to technology assessment. Prerequisite: PubH 201. (Spring)

**221 Occupational and Environmental Health (2)** Welch, Bargmann, and Staff
Principles of occupational and environmental medicine, building on the concepts introduced in PH 201. Exposure assessment. Diagnosis of clinical disease that is secondary to work or environment. Principles of occupational and environmental epidemiology. Legal, social, and ethical issues in occupational and environmental health. Prerequisite: PubH 201. (Spring)

**222 Case Studies in Preventive Medicine (2)** Riegelman and Staf
Consideration of selected issues in primary and secondary prevention, wit emphasis on the application of skills acquired in previous courses. Prerequ site: PubH 201, 202. (Summer)

**223 Implementing Preventive Medicine (2)** Davis and Staf
Practical application of principles of preventive medicine to programs in clinical, occupational, and public health settings. Prerequisite: PubH 201, 202. (Summer)

**230 Computer Applications for Public Health (3)** Kallenberg, Orthner, and Staf
Use of computers in management of health data. Laboratory instruction in use and application of software packages. Prerequisite: PubH 202. (Spring)

**233 Biostatistics for M.D.–M.P.H. Students (2)** Hirsch
Selection, basic calculations, and interpretation of statistical methods appli cable to public health, including an introduction to epidemiological analysis analysis of variance, correlation, and regression. (Spring)

**240 Design and Analysis of Health Studies (3)** Hirsch
Skills-oriented course, stressing study design and biostatistical techniques for study analysis. Prerequisite: PubH 202. (Spring)

**295 Special Projects (4)** Staf
With faculty supervision, the student undertakes an original project that applies the skills and knowledge gained in the M.P.H. program to a profes sional setting. Prerequisite: PubH 201, 202. (Fall, spring, and summer)

**296 Case Studies in Administrative Medicine (3)** Staf
Analyses of problems and policies in health systems administration. Prereq uisite: PubH 211, 213. Same as HSA 268. (Summer)

**299 Independent Study (3)** Staf
Permission of program director required.

## Radiology

***Chair:*** R. M. Allman
***Directors of Divisions:*** W. W. Olmsted *(Diagnostic Radiology)*, R. C. Reba *(Nuclear Medicine)*, C. C. Rogers *(Radiation Oncology and Biophysics)*

Courses numbered 10 to 198 are open only to students in the radiation therapy technology, radiologic technology, nuclear medicine, and radiologic science and administration programs. The following courses are open only to off-campus students: Rad 40, 41, 42, 50, 51, 60, 61, 62, 70, 71, 80, 95, 96, 97, 99, 100.

**10 Medical Ethics in Radiation Therapy Technology (1)** Dozier-Hall
Ethical issues related to the technologist's work with physicians and cancer patients, including moral and legal responsibilities and the rapport expected of the technologist. Staff

**11 Introduction to Radiation Therapy Technology (3)** Staff
Introduction to hospital and departmental organization; roles and functions of the radiation therapy technologist. Emphasis on principles of radiation therapy treatment and procedures used in the treatment of cancer patients, including basic principles of patient care and nursing procedures.

**12 Care of the Terminally Ill Patient (2)**
Fundamental concepts of death and dying, including attitudes and experiences associated with the dying process. Emphasis on patient care and aseptic techniques as they relate to the radiology service.

14 **Radiation Physics I** (2) Staff
Basic course in physics for students in the radiation therapy technology program. Standards of measure, metric measurement, laws of motion, weight, work, power, energy, and momentum. Introduction to the structure of matter, atomic and nuclear structure, periodic tables, chemical bonding, material and artificial radioactivity, decay schemes. Electrostatics and magnetism.

15 **Radiation Physics II** (3) Staff
Continuation of Rad 14. Current flow, ohms and Joule's law, series/parallel, compound circuits, battery types and functions, metering devices, electrical safety. Electromagnetism and induction, alternating current principles, AC cycle, induction and inductor, capacitance and capacitors. Applications of electronic principles to X-ray equipment and components, transformers, generators, motors, rectifiers, current control devices, fuses, circuit breakers, magnetic relays, circuitry of fixed and mobile X-ray units. Laboratory work.

16 **Radiation Therapy Physics, Dosimetry, and Safety I** (2) Staff
Concepts of interaction of radiation with matter, emphasizing the photoelectric compton and pair–production effects, units of radiation, concepts of depth doses, isodose curves and tissue–air ratios for different energies, TSD and field size. Techniques of treatment planning, including wedge fields and compensators using $CO^{60}$ units and megavoltage linear accelerators. Concepts of linear source dosimetry and computer treatment planning. Introduction to the dosimetry of electrons and neutrons. Concepts of radiation detection and safety as applied to radiation therapy, including effects of time, distance, and shielding.

17 **Radiation Therapy Physics, Dosimetry, and Safety II** (2) Staff
Prerequisite: Rad 16.

18 **Radiation Therapy Physics, Dosimetry, and Safety III** (2) Staff
Prerequisite: Rad 17.

19 **Radiation Pathology** (2) Staff
Basic concepts of pathology. Emphasis on tumor pathogenesis and the biological and pathological effects of ionizing radiation in living organisms.

20 **Radiation Therapy Techniques and Oncology I** (3) Staff
Management of patients with a variety of malignant diseases by radiotherapeutic techniques. Preparing the patient for treatment, patient positioning, and immobilization techniques.

21 **Radiation Therapy Techniques and Oncology II** (3) Staff
Continuation of Rad 20.

23 **Clinical Experience** (1 to 4) Staff
Students are assigned to a local health facility for 4 to 12 hours per week during the fall and spring semesters. Observation and some participation in the management of the patient undergoing radiation therapy.

24 **Anatomy and Physiology Overview** (1) Staff
Review of the structure, function, and processes of the human body; major organ systems are considered.

25 **Quality Assurance in Radiation Therapy Technology** (2) Staff
Quality assurance procedures, including review of patient charts, monitoring of equipment, and evaluation of treatment facilities.

33 **Clinical Practicum** (3 to 5) Staff
Participation in treatment planning and therapeutic applications at a local health care facility, under supervision of an approved preceptor. Student gains experience in using a wide variety of technical procedures. Full-time program participation required for 15 weeks during the summer sessions. Admission by permission of instructor.

40 **Clinical Training and Experience in X-ray Technology I** (2) Staff
Instruction and close supervision in the use of radiologic techniques to examine the digestive, urinary, female reproductive, central nervous, and

circulatory systems. Chest and abdomen radiography, orthopaedic radiography, ENT and neurologic radiography, portable radiographic examinations, pediatric radiography, nuclear medicine, radiation therapy. Staff

41 **Clinical Training and Experience in X-ray Technology II** (2)
Prerequisite: Rad 40. Staff

42 **Clinical Training and Experience in X-ray Technology III** (2)
Prerequisite: Rad 41.

43 **Clinical Experience in Nuclear Medicine I** (4) Cianci and Staff
Practical study and supervised experience, with emphasis on indications and contraindications, procedures and methods, physiological and procedural factors that may result in a false study, radiation safety techniques, preparation and development of new radiopharmaceuticals and research methodology, and administrative procedures.

44 **Clinical Experience in Nuclear Medicine II** (5) Cianci and Staff
Prerequisite: Rad 43. Staff

50 **Radiographic Anatomy and Positioning II** (4)
Human anatomy and positioning as applied to radiologic technology. Structure and function of the human skeleton and topographical anatomy, both normal and pathological. Positioning techniques are practiced in the laboratory. Staff

51 **Radiographic Anatomy and Positioning IV** (4)
Basic positioning techniques, including those applicable to the upper and lower extremities, are studied and practiced, using radiographic machines, phantoms, and film-processing methods. Staff

55 **Imaging Procedures** (3)
Anatomy, physiology, and pathology as related to imaging procedures. Basic methodology, including the imaging of bone, brain, liver, lung, spleen, parathyroid, pancreas. Liver function, liver–lung transmission, lung ventilation, bone marrow, cardiac blood pool. Cisternography and parotid ventriculography. Miscellaneous scans. Cardiac flow and brain studies. Staff

56 **Hematologic and Radionuclide Dilution Procedures** (3)
Anatomy, physiology, and pathology as related to hematologic and radionuclide dilution procedures. Basic protocol, including plasma volume and related plasma studies, red-cell volume and related red-cell studies, studies of iron metabolism, and placental localization and scanning. Staff

57 **Organ Concentration–Excretion Measurements** (3)
Anatomy, physiology, and pathology as related to organ concentration-excretion measurements. Procedures, including thyroid uptake and its variations, thyroid scan, metastatic chest survey, renogram, renal scan, and renal flow study. Staff

59 **Competitive Binding Radioimmunoassay** (2)
Basic concepts of radioimmunoassay and procedures for any competitive binding radioimmunoassay. Specific concepts and procedure for T3, T4, and serum B-12 determinations; factors affecting those determinations and the interpretation of their results. Staff

60 **Radiographic Technique** (4)
History and development of X-rays and X-ray tubes. Major factors affecting film quality. Quality assurance. Staff

61 **Radiographic Anatomy and Positioning III** (4)
Techniques of radiography employing contrast media, fluoroscopy, spot films, body section radiography, pelvimetry, location of foreign body in the eye, and operating techniques. Prerequisite: Rad 60. Staff

62 **Darkroom Procedures** (2)
Processing of film after exposure; care and handling of darkroom equipment, types of film, handling, and storage; mixing and handling of chemicals and the action of these chemicals in processing; effects of heat and cold on

chemicals; diagnosis of improper developing techniques. Laboratory work.

65 **Basic Chemistry** (3) Staff
Introduction to basic chemistry: kinds of matter, atomic structure, the periodic table, chemical bonding, formulas and equations, solutions, acid–base reactions. Introduction to organic chemistry and biochemistry. Laboratory sessions.

66 **Radiopharmaceuticals** (3) Staff
Uses of radionuclides in medicine, basic principles of a Mo–99/Tc–99m generator, radiopharmaceuticals and their action within the body, preparation of radiopharmaceuticals using generator-produced nuclides, quality control, accountability, procurement, clinical orientation.

70 **Radiographic Physics I** (3) Staff
Basic concepts of physics, including standards of measure, metric measurement, laws of motion, weight, work, power, energy, and momentum. Introduction to structure of matter, atomic and nuclear structure, periodic tables, chemical bonding, material and artificial radioactivity, series decay. Electrostatics and magnetism. Laboratory work.

71 **Radiographic Physics II** (4) Staff
Basic concepts of current flow, ohms and Joule's law, series/parallel, compound circuits, battery types and functions, metering devices, electrical safety. Electromagnetism and induction, alternating current principles, AC cycle, induction and inductor, capacitance and capacitors. Applications of electronic principles to X-ray equipment and components, transformers, generators, motors, rectifiers, current-control devices, fuses, circuit breakers, magnetic relays, circuitry of fixed and mobile X-ray units. Laboratory work.

72 **Radiation Instrumentation** (5) Staff
Theoretical and practical aspects of radiation detectors: types, components, and operation. Collimators. Geometry. Introduction to rectilinear scanning and stationary imaging. Clinical orientation.

75 **Fundamentals of Atomic and Nuclear Physics** (3) Staff
Basic units, quantum theory, Bohr theory, atomic and nuclear structure, radioactivity and decay, alpha and beta particles, electromagnetic radiation, series decay, radioactive equilibrium, I.C.R.U.

80 **Mathematics of Radiology** (3) Staff
Principles of mathematics as applicable to the physics of radiologic technology: use of logarithms, including multiplication, division, powers, and roots; scientific notation; geometry of the circle, square, and rectangle; basic trigonometric functions; linear equations in the unknown; Cartesian coordinate plane; slope of straight line; linear equations from given conditions; and graphic solution of two or more linear equations.

81 **Basic Mathematics** (3) Staff
Review of basic high school mathematics, basic algebra, common and natural logarithms and their manipulation, linear and logarithmic graphing, and manipulation of a log–log slide rule.

82 **Applied Technical Mathematics** (3) Staff
Mathematics as applicable to nuclear medicine. Basic decay formula and its variations, calculation of doses of radionuclides, basic statistics terminology, frequency distributions, confidence limits, standard error, efficient distribution of counting time, statistics relating to rectilinear and stationary imaging.

90 **Medical Ethics** (1) Staff
Ethics of physician–technician–patient relationships. Responsibilities, both moral and legal, to physician and patient; the rapport expected of the technologist.

91 **Special Projects in Radiology** (arr.) Staff
Independent study on an aspect of radiology determined by the student and

the instructor. Students may register by petition only.

**93 Radiobiology and Radiation Dosimetry (3)**
Interaction of radiation with matter. Radiation effects on molecular, cellul
tissue, and organ levels. Genetic and somatic effects of ionizing radiatio
Classical and M.I.R.D. methods of absorbed dose calculation.

**94 Radiological Safety (3)**
Introduction to radiation safety. Units of radiation exposure and do
Licensing; NRC regulations; accountability and records. Receipt, storag
handling, transportation, and disposal of radioactive materials. Monitorin
shielding, dose–distance relationships, personnel dosimetry, radiation illne
radiographic instruments, radiation safety clothing, radioactive "spill" proc
dure.

**95 Radiation Safety (2)**
Techniques and equipment design for reducing unnecessary radiograph
exposure of the patient and technologist.

**96 Radiation Biology (3)**
Effects of ionizing radiation on various cells, tissues, organs, and the huma
body as a whole. Organic and inorganic molecules. Human immunity syste
Effects on pregnancy and relative radiosensitivity of the developing embry
possible genetic effects of radiation. Chronic and acute effects of radiatio
Use and history of radiation in therapy; classification of neoplasms, types
therapy units, and treatments. Prerequisite: Rad 50, 70, 71.

**97 Radiographic Anatomy and Positioning V (4)**
Special radiographic procedures, including cerebral, abdominal, and cardi
angiography. Lecture and laboratory. Prerequisite: Rad 61, 71.

**98 Therapy Procedures (1)**
Introduction to radiation therapy and radium implants. Anatomy, physi
ogy, and pathology as related to phosphorous–32 and iodine–131 therapie
The technologist's responsibilities.

**99 Alternate Imaging Systems (3)**
Various modalities of radiographic imaging systems and types of equipmen
Intensification screens, fluoroscopy, spot filming, image intensification, cin
fluoroscopy, film changes, thermography, electron radiography, and compu
erized axial tomography. Prerequisite: Rad 60, 71, 95.

**100 Pathology (3)**
Radiographic pathology relevant to the radiologic technologist. Clinic
description of the disease process and radiographic demonstrations.

**130 Mathematics of Radiology (3)**
Principles of mathematics applicable to the physics of radiologic technology
use of exponential and logarithm function, including multiplication, divisio
powers, and roots; scientific notation; geometry of the circle, square, and
rectangle; basic trigonometric functions, linear equations in the unknown
Cartesian coordinate plane; slope of straight line; and linear equations from
given conditions.

**140 Radiology Administration (4)**
Topics related to radiologic management at the department level, includi
organizational behavior, planning, and control. Discussion of the logistics
managing a radiology section. Prerequisite: HSA 142, 153, 154, 170.

**145 Administrative Project: Diagnostic Radiology (3)**
For students concentrating in diagnostic radiology. Completion of a project in
a radiology department, using administrative principles. Weekly seminars on
current issues in management and leadership. Concurrent registration in
140.

**147 Administrative Project: Nuclear Medicine (3)**
For students concentrating in nuclear medicine. Completion of a project for a
nuclear medicine department, using administrative principles. Weekly semi-

nars on current issues in management and leadership. Concurrent registration: Rad 140.

149 **Administrative Project: Radiation Therapy** (3) Staff
For students concentrating in radiation therapy. Completion of a project for a radiation therapy department, using administrative principles. Weekly seminars on current issues in management and leadership. Concurrent registration: Rad 140.

160 **Computer Applications in Radiology** (3) Gaskill
Administrative and clinical applications of the digital computer in radiology, with emphasis on the design, procurement, and implementation of computer systems. Students participate in team projects involving operational management or clinical systems, write a paper, and prepare a class presentation based on project results.

167 **Radiation Physics and Safety** (3) Rosenstein
Concepts of matter, energy, and electromagnetic radiation. Mechanisms in the production of X-rays and X-ray circuits, including half-wave and full-wave rectification and three-phase generators. Interaction of radiation with matter, emphasizing the photoelectric, Compton, and pair-production effects. Radiation detection and dosimetry; roentgen rad and rem units of radiation. Radiation safety as applied to diagnostic radiology, nuclear medicine, and radiotherapy, including effects of time, distance, and shielding. Maximum permissible concentrations, internal dose problems. Prerequisite: Rad 92.

171 **Introduction to the Physics of Nuclear Medicine and Radiation Therapy** (3) McElroy
Nuclear medicine concepts, radiopharmaceuticals, detection, measurement, imaging equipment, dosimetry, and *in vitro* kits. Radiation therapy methods, calibrations, checks, calculations. Regulations governing the clincical use of radiation. Emphasis on clinical applications, quality assurance methods, and magnetic aspects. Prerequisite: Rad 130.

175 **Physics of Radiological Imaging** (3) Butler
Principles, design, and operation of diagnostic X-ray systems and components, including film and screens, fluoroscopic systems, computerized tomography, digital radiology, and mammography, with emphasis on producing quality radiographic images at the lowest radiation dose. Physics of ultrasound. Prerequisite: Rad 167.

180 **Special Projects in Radiology** (arr.) Staff
For selected students in the radiologic sciences and administration program who wish to pursue independent research on a current topic in radiologic technology, physics, or administration. Students must complete a written report on the project and may be required to give an oral presentation in an appropriate course.

190 **Radiation Biology** (3) Bradley
Radiation physics applied to biological systems. Radiation chemistry of water and organic molecules. Radiation effects on cells, tissues, and whole organisms. DNA damage, repair, carcinogenesis, and genetics. Risks and benefits; protective measures.

195 **Quality Control in X-Ray Imaging** (3) Butler
Laboratory course. Experience in quality assurance testing of processor, film, darkroom systems; X-ray generators and tubes; phototimers; fluoroscopic systems; and conventional and computerized tomography systems. Establishing, maintaining, and evaluating equipment-testing programs.

196 **Fundamentals of Magnetic Resonance Imaging** (3) Butler
Introduction to magnetic resonance imaging, including physical principles, imaging principles, equipment design, siting requirements, clinical safety, quality assurance, image interpretation, special techniques, financial considerations, and future technical developments. Prerequisite: one year of college-level physics. **(Fall)**

197 **Practicum in Magnetic Resonance Imaging** (2) Buth
Students learn to operate a magnetic resonance imaging unit, screen a position patients, select appropriate pulse sequences, and evaluate ima quality and artifacts; become familiar with specific characteristics of t clinical unit in use; and observe clinical interpretation. Prerequisite concurrent registration: Rad 196. (Fall and spring)

198 **Practical Approach to Diagnostic Ultrasound** (3) Sta
Introduction to diagnostic ultrasound, with emphasis on basic applicatio Ultrasound physics, scanning fundamentals, cross-sectional anatomy, a approach techniques for all aspects of ultrasound, excluding echocardiogra and equipment design/purchase considerations. Prerequisite: clinical expe ence as a technologist, nurse, or physician. (Spring)

201 **Advanced Topics in Nuclear Magnetic Resonance** (3) Hoult, Selik
Topics include generation of nuclear magnetic resonance signals. B equations, rotating frame analysis, relaxation mechanisms, quadratu phase detection, chemical shift, receiver coil design, image encoding, sli selection shim coils, magnet design, data processing, quality assurance, an zonal and tesseral harmonics mapping. Prerequisite: permission of instructo

383 **Clinical Radiology** (5) Allman, Jacobs, and Staf
For the initial portion of the course, students work in a simulated readin room with a faculty member in a review of the American College of Radiolog learning file of radiographs. Students then rotate through and observe various sections in the University Hospital department of radiology.

384 **Introduction to Radiology** (5) Shannon and Staf
Scope, medical importance, and trends of medical imaging. Lectures on an clinical observation of general diagnostic radiology, vascular and interven tional procedures, computed tomography, and nuclear medicine. Overview imaging in clinical decision making. (Fall)

385 **Nuclear Medicine** (arr.) Reba and Staf
Introduction to the application of radiotracer techniques in clinical medicine and biomedical research. Participation as clinical nuclear medicine intern o as research assistant. Student is encouraged to become involved with one the research projects of the division or in an independent investigativ oriented toward pharmaceutical chemistry, computer applications, or patien care. University Hospital.

386 **Radiation Oncology** (arr.) Rogers, Ne
Introduction to radiation oncology, including basic principles of radiatio physics and biology as well as therapy techniques. Experience in manage ment of patients with a variety of malignant diseases, with emphasis o diagnosis, staging, and treatment alternatives.

387 **Subspecialty Diagnostic Radiology** (arr.) Jacobs and Staf
Subspecialty training in radiological diagnosis to prepare students for spe cialty medical training. Offerings include bone, pulmonary, gastrointestinal urologic, obstetric and gynecologic, and neurologic subspecialties. Prerequi site: permission of department. University Hospital.

390–92 **Extramural Radiology Elective** (arr.)
Elective periods at other institutions. Staples and Staf

400 **Diagnostic Radiology** (arr.)
General radiography, fluoroscopy and nuclear medicine, special procedures ultrasound and/or CT. Review and study of teaching image file. Washingto Hospital Center. Ghaed

401 **Diagnostic Radiology** (arr.)
Participation in general radiologic interpretation, nuclear radiology, special procedures, ultrasound, and CT. Review and study of teaching file. Dail conferences. Walter Reed Army Medical Center.

402 **Reading Chest Films** (3) Jacobs
Two-week radiology elective designed to improve the physician's understanding of radiographic principles and diagnostic approaches, with emphasis on chest films.

403 **Reading Bone Films** (3) Jacobs
Two-week radiology elective designed to improve the physician's understanding of radiographic principles and diagnostic approaches, with emphasis on bone films.

## Surgery

*Chair:* R. G. DePalma
*Directors of Divisions:* L. E. Smith *(Colon and Rectal)*, P. E. Shorb, Jr. *(General Surgery)*, J. M. Gitelman *(Oral Surgery)*, W. R. Wilson *(Otolaryngology)*, J. G. Randolph *(Pediatric Surgery)*, M. H. McGrath *(Plastic Surgery)*, B. L. Aaron *(Thoracic and Cardiovascular Surgery)*

303 **Clinical Clerkship** (10) Hix
Required for medical students. Eight weeks at University Hospital and National Naval Medical Center.

351 **Otolaryngology, Head and Neck Surgery** (arr.) Burgess
Participation in clinical service involving inpatients and outpatients. Walter Reed Army Medical Center.

352 **Otolaryngology** (arr.) Thompson
Inpatient and outpatient rotations; operating room experience. National Naval Medical Center.

353 **Otolaryngology, Head and Neck Surgery** (arr.) Wilson, Gulya
Work-up and care of clinical and hospitalized patients. Participation in surgery and ER consultations. This course partially fulfills the surgical subspecialty requirement if the student did not have an ENT experience during the third-year surgery clerkship.

376 **Advanced Surgery** (5) Tsangaris
Participation in total patient care, including operative procedures, under close supervision.

378 **Intensive Care Unit** (5) Fouty and Staff
Introduction to the management of acutely ill surgical patients, including cases involving trauma; neurosurgery; and cardiovascular–thoracic, abdominal, and orthopaedic surgery. Washington Hospital Center.

379 **Transplantation Immunology** (arr.) Karmi
Clinical renal transplantation and preservation. Daily teaching rounds, literature conference, seminar presentation, weekly surgical–medical nephrology rounds. University Hospital.

383 **Endocrine Surgery** (arr.) Geelhoed
Management of endocrine disorders. Emphasis on control of hyperfunction and neoplasms of the thyroid, parathyroid, adrenal, and pancreatic islet cell glands. Library and laboratory research and clinical exposure to surgical endocrinology. University and V.A. Hospitals.

384 **Thoracic/Cardiovascular Surgery** (5) Aaron
Basic principles used in thoracic and cardiovascular surgery. Four-week elective periods. University Hospital and Medical Faculty Associates.

385 **Plastic and Reconstructive Surgery** (arr.) McGrath
Experience in the full spectrum of reconstructive surgery in both children and adults, including congenital anomalies, cosmetic surgery, neoplasms of the head and neck, facial trauma, benign and malignant skin lesions, hand surgery, burns, microsurgery, and breast surgery. Responsibilities in the

operating room, at the bedside, and in the clinic. University and Children's Hospitals.

389 **Surgical Preceptorship** (arr.) Tsangaris
Care of general surgical patients as seen in private practice.

390–95 **Extramural Surgery Elective** (arr.)
Elective periods at other institutions.

400 **Special Programs** (arr.) Tsangaris
Special elective developed in consultation with department faculty.

401 **Peripheral Vascular Surgery** (arr.) Keshishian and Staff
Introduction to the physiologic basis for an approach to peripheral vascular disease. Initial assignment to the chief cardiovascular technician in the noninvasive laboratory. Modern diagnostic techniques, including observations of contrast arteriography. Student then follows a patient from admission, through surgery, and into the postoperative period. Opportunity to participate in private office practice. Washington Hospital Center.

402 **Burns** (arr.) Jordan
Participation in a nine-bed dedicated burn intensive care unit with an associated rehabilitation unit. Full-time attending.

403 **Peripheral Vascular Surgery** (5) Giordano and Staff
General introduction to peripheral vascular surgery. Time spent in vascular laboratory, in learning the basic arteriovenous and cerebrovascular examinations, and in evaluating vascular patients in an office practice. Assignment to one of the surgical services, participating in management and care of patients and attending to them in the operating room, if appropriate.

404 **Experimental Surgery** (arr.) Geelhoed
Projects in surgical research laboratories, employing animal models and experimental operative procedures in physiologic investigations. Emphasis on design of experiments, performance of experimental surgical techniques, precision in laboratory data gathering, and analysis of data. Areas of investigation include surgical endocrinology, transplantation, and cardiovascular physiology.

405 **Hand Surgery Clinic/Research** (arr.) Seyfer
Participation in care of patients of all ages, working closely with hand surgeons from orthopaedic and plastic surgical services. Basic approaches to diagnosis and treatment of a wide variety of hand disorders, including nerve injuries, arthritic conditions, congenital anomalies, fractures, vascular problems, and reconstructive techniques for these problems. Exposure to microsurgery. Participation in clinics, conferences, ward rounds, and operating room. Walter Reed Army Medical Center.

406 **Plastic Surgery Clinic/Research** (arr.) Seyfer
Participation in care of patients and exposure to a wide variety of surgical problems in all age groups, ranging from congenital anomalies such as cleft lip/palate and syndactyly to complex reconstructive surgery for abdominothoracic wall defects, head and neck cancer, and extremity reconstruction. Cosmetic surgery involving face, eyelids, and other areas. Participation in combined orthopaedic/plastic surgery hand service. Experience in evaluation and treatment of conditions related to the upper extremity. Research opportunities. Student assists in microsurgical laboratory on a regular basis. Walter Reed Army Medical Center.

## Urology

*Chair:* H. C. Miller, Jr.

302 **Clinical Clerkship** (3) — Karmi
Observation of urologic conditions and procedures for diagnosis and treatment. Radiologic and pathologic studies, endoscopy and surgery, collateral reading, weekly staff conference. University, V.A., Fairfax, and Children's Hospitals.

381 **Clinical Urology** (5) — Karmi and Staff
Observation of urologic conditions and procedures for diagnosis and treatment. Radiologic and pathologic studies, endoscopy and surgery, collateral reading, weekly staff conference. University, V.A., Children's, and Fairfax Hospitals.

382 **Clinical Urology** (arr.) — Bensimon and Staff
Observation of urologic conditions and procedures for diagnosis and treatment. Radiologic and pathologic studies, endoscopy and surgery, collateral reading, weekly staff conference. V.A. Hospital.

390–92 **Extramural Elective** (arr.)
Elective periods at other institutions.



# Faculty and Staff of Instruction*

## Emeriti

Theodore Judson Abernethy, *Professor Emeritus of Clinical Medicine*
B.S. 1925, Denison University; M.D. 1929, Johns Hopkins University

John Pletch Adams, *Professor Emeritus of Orthopaedic Surgery and of Child Health and Development*
B.S. 1943, University of Missouri; M.D. 1945, Washington University

Theodore Crandall Alford, *Professor Emeritus of Surgery*
A.B. 1944, Haverford College; M.D. 1947, Johns Hopkins University

Louis Katz Alpert, *Professor Emeritus of Medicine*
B.S. 1928, M.D. 1932, Yale University

Seymour Alpert, *Professor Emeritus of Anesthesiology*
B.A. 1939, Columbia University; M.D. 1943, State University of New York Downstate Medical Center

William Staton Anderson, *Professor Emeritus of Clinical Child Health and Development*
B.A. 1927, Duke University; M.D. 1931, Johns Hopkins University

Robert Henry Barter, *Professor Emeritus of Obstetrics and Gynecology*
B.S. 1937, M.D. 1940, University of Wisconsin

Thomas McPherson Brown, *Professor Emeritus of Medicine*
B.A. 1929, Swarthmore College; M.D. 1933, Johns Hopkins University

Christian Virgil Cimmino, *Professor Emeritus of Clinical Radiology*
A.B. 1937, Harvard University; M.D. 1941, Johns Hopkins University

Charles Seymour Coakley, *Professor Emeritus of Anesthesiology*
M.D. 1937, George Washington University

Leon Richard Culbertson, *Professor Emeritus of Urology*
B.S., M.D. 1936, University of Virginia

Henry Lauran Darner, *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1916, Western Maryland College; M.D. 1920, Johns Hopkins University

Samuel Mayer Dodek, *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1923, George Washington University; M.D. 1927, Thomas Jefferson University; M.A. 1931, Case Western Reserve University

William Rankin Duryee, *Research Professor Emeritus of Pathology (Experimental)*
B.A. 1927, Ph.D. 1933, Yale University

James Albert Dusbabek, *Professor Emeritus of Clinical Obstetrics and Gynecology*
M.D. 1934, George Washington University

Clayton Bernard Ethridge, *Professor Emeritus of Medicine*
M.D. 1933, University of Virginia

Henry Leon Feffer, *Professor Emeritus of Orthopaedic Surgery*
B.A. 1939, Indiana University; M.D. 1942, Indiana University–Purdue University at Indianapolis

James Joseph Feffer, *Professor Emeritus of Clinical Engineering and of Medicine*
B.A. 1935, Indiana University; M.D. 1938, Indiana University at Indianapolis

*The Faculty and Staff of Instruction listed here by department represent appointments current as of January 1988. Faculty and staff members who hold appointments in two or more departments have the department of primary responsibility listed first.

James Quincy Gant, Jr., *Professor Emeritus of Clinical Dermatology*
B.A. 1930, M.S. 1931, Ohio State University; M.D. 1935, Medical College of Virginia of Virginia Commonwealth University

Frederick Chapman Green, *Professor Emeritus of Child Health and Development and of Health Care Sciences*
B.S. 1942, Indiana University at Bloomington; M.D. 1944, Indiana University–Purdue University at Indianapolis

Robert Henry Groh, *Professor Emeritus of Clinical Neurology*
B.S. 1935, M.D. 1937, University of Pittsburgh

Clarence Richard Hartman, *Associate Professor Emeritus of Microbiology*
B.A. 1933, M.D. 1936, George Washington University

Murdock Head, *Airlie Professor Emeritus of Medical and Public Affairs*
D.D.S. 1947, University of Louisville; M.D. 1953, University of Vermont; J.D. 1958, George Washington University

Roy Hertz, *Research Professor Emeritus of Pharmacology*
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hopkins University

William Allen Howard, *Professor Emeritus of Clinical Child Health and Development*
M.D. 1934, Tulane University

Vincent Michael Iovine, *Professor Emeritus of Clinical Surgery*
B.S. 1931, Manhattan College; M.D. 1935, Columbia University

Paula Reines Kaiser, *Associate Professor Emeritus of Anesthesiology*
M.B., Ch.B. 1936, University of St. Andrews, Scotland; M.D. 1937, State University of New York

Hayden Kirby-Smith, *Professor Emeritus of Clinical Dermatology*
B.S. 1927, University of the South; M.D. 1937, George Washington University

Calvin Trexler Klopp, *Professor Emeritus of Surgery*
B.A. 1934, Swarthmore College; M.D. 1938, Harvard University

Norman Clifford Kramer, *Professor Emeritus of Medicine*
B.S. 1948, The Citadel, M.S. 1950, M.D. 1954, George Washington University

Fred Leonard, *Research Professor Emeritus of Medicine and of Orthopaedic Surgery*
B.S. 1938, University of Arkansas; M.S. 1942, Ph.D. 1947, Polytechnic Institute of New York

Reginald Spencer Lourie, *Professor Emeritus of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.S. 1930, Cornell University; M.D. 1936, State University of New York Downstate Medical Center, Med.Sc.D. 1941, Columbia University

Benjamin Manchester, *Professor Emeritus of Clinical Medicine*
M.D. 1935, George Washington University

William Laverne Marsh, *Professor Emeritus of Pathology and of Anesthesiology*
B.S. 1942, Purdue University; M.D. 1946, State University of New York at Buffalo

William Prentiss McKelway, *Professor Emeritus of Clinical Obstetrics and Gynecology*
A.B. 1943, Washington and Lee University; M.D. 1950, George Washington University

Frank Nelson Miller, Jr., *Professor Emeritus of Pathology*
B.S. 1943, M.D. 1948, George Washington University

Joseph Francis Ney, *Professor Emeritus of Clinical Medicine*
B.S. 1931, University of Virginia; M.D. 1935, Harvard University

George Nordlinger, *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1918, M.D. 1922, George Washington University

Jed Williams Pearson, Jr., *Clinical Professor Emeritus of Obstetrics and Gynecology*
A.B. 1934, DePauw University; M.D. 1938, Indiana University

Thomas Martin Peery, *Professor Emeritus of Pathology*
B.A. 1928, D.M.S. 1966, Newberry College; M.D. 1932, Medical University of South Carolina

Leonard Theodore Peterson, *Professor Emeritus of Clinical Orthopaedic Surgery*
B.A., B.S. 1928, M.D. 1931, University of Minnesota

Hubert Vincent Pipberger, *Professor Emeritus of Clinical Engineering and of Medicine*
B.A. 1938, Deutsches Kollege, Germany; M.D. 1951, Rheinische Friedrich Wilhelms University, Germany

Herbert Pollack, *Professor Emeritus of Clinical Medicine (Biochemistry)*
B.A. 1925, Washington and Lee University; M.D. 1929, Cornell University; Ph.D. 1933, University of Minnesota

Neel Jack Price, *Professor Emeritus of Clinical Obstetrics and Gynecology*
A.B. 1939, B.S. 1940, M.D. 1942, University of Oklahoma

Lawrence Elias Putnam, *Professor Emeritus of Clinical Medicine*
B.A. 1930, M.D. 1934, Harvard University

Jack Jacob Rheingold, *Professor Emeritus of Clinical Medicine*
B.A. 1936, University of Alabama; M.B. 1940, M.D. 1941, University of Cincinnati

Hugo Victor Rizzoli, *Professor Emeritus of Neurological Surgery*
A.B. 1936, M.D. 1940, Johns Hopkins University

Mary Louise Robbins, *Professor Emeritus of Microbiology*
B.A. 1934, American University; M.A. 1940, Ph.D. 1944, George Washington University

Monroe James Romansky, *Professor Emeritus of Medicine*
A.B. 1933, University of Maine; M.D. 1937, University of Rochester

Arthur Bernard Rosenbaum, *Professor Emeritus of Clinical Medicine and of Clinical Health Care Sciences*
B.S. 1931, City University of New York, City College; M.D. 1935, New York University

Thomas Stone Sappington, *Professor Emeritus of Clinical Medicine*
B.A. 1937, M.D. 1941, Harvard University

Bertram Jacob Lyons Sauerbrunn, *Professor Emeritus of Clinical Radiology*
B.S. 1936, Lafayette College; M.D. 1940, Union University

Benjamin Williams Smith, *Professor Emeritus of Biochemistry*
B.S. 1940, Virginia Polytechnic Institute and State University; M.S. 1947, Ph.D. 1951, George Washington University

Nicholas Patrick D. Smyth, *Professor Emeritus of Clinical Surgery*
M.S. 1948, M.B., Ch.B. 1949, University College, Dublin; M.S. 1954, University of Michigan

Harold Stevens, *Professor Emeritus of Neurology*
B.S. 1933, Pennsylvania State University; M.A. 1934, Ph.D. 1937, M.D. 1941, University of Pennsylvania

Donald Harrison Stubbs, *Professor Emeritus of Clinical Anesthesiology*
B.A. 1929, M.A. 1931, M.D. 1932, George Washington University

Irene Gorski Tamagna, *Professor Emeritus of Medicine*
M.D. 1943, Medical College of Pennsylvania

Ira Rockwood Telford, *Professor Emeritus of Anatomy*
B.A. 1931, M.A. 1933, University of Utah; Ph.D. 1942, George Washington University

Charles Waters Thompson, *Professor Emeritus of Clinical Medicine*
M.D. 1941, George Washington University

Janet Graeme Travell, *Professor Emeritus of Clinical Medicine*
B.A. 1922, Wellesley College; M.D. 1926, Cornell University

Carleton Raymond Treadwell, *Professor Emeritus of Biochemistry*
B.A. 1934, Battle Creek College; M.S. 1935, Ph.D. 1939, University of Michigan

Robert James Van Houten, *Professor Emeritus of Anesthesiology*
B.S. 1950, Albright College; M.D. 1954, Hahnemann Medical College

James Christopher Walsh, Jr., *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1941, M.D. 1945, Georgetown University

James Winston Watts, *Professor Emeritus of Neurological Surgery*
B.S. 1924, Virginia Military Institute; M.D. 1928, University of Virginia

Thomas Glenn Webster, *Professor Emeritus of Psychiatry and Behavioral Sciences*
A.B. 1946, Fort Hays State University; M.D. 1949, Wayne State University

Jonathan Marshall Williams, *Professor Emeritus of Clinical Neurological Surgery*
B.S. in Med. 1936, Loyola University of Chicago; M.D. 1938, University of Chicago

## Active

### Anatomy

Ernest Narinder Albert, *Professor of Anatomy*
B.S. 1959, High Point College; M.S. 1963, University of Pittsburgh; Ph.D. 1965, Georgetown University

Frank Duane Allan, *Professor of Anatomy*
B.S. 1947, M.S. 1949, University of Utah, Ph.D. 1954, Louisiana State University

Ronald Carl Bohn, *Associate Professor of Anatomy*
B.S. 1973, M.S. 1976, Pennsylvania State University; Ph.D. 1980, State University of New York Upstate Medical Center

Milton Wilfred Brightman, *Professorial Lecturer in Anatomy*
B.S. 1945, M.A. 1948, University of Toronto; Ph.D. 1954, Yale University

Joseph Amedeo Di Paolo, *Associate Professorial Lecturer in Anatomy*
A.B. 1948, Wesleyan University; M.S. 1949, Case Western Reserve University; Ph.D. 1951, Northwestern University

Mary Frances Ericksen, *Associate Professorial Lecturer in Anatomy*
B.A. 1947, Indiana University; M.A. 1957, Columbia University; Ph.D. 1973, George Washington University

Barbara Gilson Hoffman, *Visiting Associate Professor of Anatomy*
B.A. 1968, Temple University; Ph.D. 1975, Thomas Jefferson University

Kurt Edward Johnson, *Professor of Anatomy*
B.S. 1965, Johns Hopkins University; M.Phil. 1969, Ph.D. 1970, Yale University

Thomas Nick Johnson, *Professor of Anatomy*
B.S. 1944, St. Ambrose College; M.S. 1949, Michigan State University; Ph.D. 1953, University of Michigan

Marilyn Jean Koering, *Professor of Anatomy*
B.A. 1960, College of St. Scholastica; M.S. 1963, Ph.D. 1967, University of Wisconsin

Kenna Dale Peusner, *Associate Professor of Anatomy*
B.S. 1968, Simmons College; Ph.D. 1974, Harvard University

Jeffrey Mark Rosenstein, *Associate Professor of Anatomy*
B.A. 1971, Kent State University; Ph.D. 1976, Pennsylvania State University

Frank James Slaby, *Associate Professor of Anatomy*
B.S. 1965, California Institute of Technology; Ph.D. 1971, University of California, Berkeley

Richard Saxon Snell, *Professor of Anatomy and of Orthopaedic Surgery*
M.B., B.S. 1949, Ph.D. 1955, M.D. 1961, University of London

Douglas Henry Ubelaker, *Professorial Lecturer in Anatomy*
B.A. 1968, Ph.D. 1973, University of Kansas

Raymond John Walsh, *Associate Professor of Anatomy*
B.S. 1969, University of Massachusetts; Ph.D. 1978, Tufts University

### Anesthesiology

Michael David Abramowitz, *Associate Clinical Professor of Anesthesiology*
M.B., Ch.B. 1972, University of Witwaterstrand, South Africa

Alice Hackney Altstatt, *Associate Professor of Anesthesiology*
B.A. 1949, Bryn Mawr College; M.A. 1952, M.D. 1956, Vanderbilt University

Leonard Bachman, *Clinical Professor of Anesthesiology and of Child Health and Development*
B.S. 1946, Franklin and Marshall College; M.D. 1949, University of Maryland

Matthew Joseph Becker, *Assistant Professor of Anesthesiology and of Child Health and Development*
B.S. 1971, Massachusetts Institute of Technology; M.D. 1974, Duke University

Lynn M. Broadman, *Assistant Professor of Anesthesiology and of Child Health and Development*
B.A. 1962, Miami University; M.D. 1974, Medical College of Ohio

May Lin Chin, *Assistant Professor of Anesthesiology*
M.B., B.S. 1975, University of Melbourne

Basil Elias Economopoulos, *Assistant Clinical Professor of Anesthesiology*
M.D. 1962, National University of Athens, Greece

Sol S. Edelstein, *Associate Clinical Professor of Anesthesiology*
B.S. 1968, M.D. 1972, Wayne State University

Burton Seymour Epstein, *Seymour Alpert Professor of Anesthesiology; Professor of Child Health and Development*
B.A. 1954, M.D. 1957, George Washington University

Alan I. Fields, *Associate Professor of Anesthesiology and of Child Health and Development*
M.D. 1970, State University of New York Downstate Medical Center

Quentin A. Fisher, *Assistant Professor of Anesthesiology and of Child Health and Development*
B.S. 1982, University of Michigan; M.D. 1972, State University of New York Downstate Medical Center

Raafat Samy Hannallah, *Associate Professor of Anesthesiology and of Child Health and Development*
M.B., Ch.B. 1966, Cairo University, Egypt

Peter R. Holbrook, *Professor of Anesthesiology and of Child Health and Development*
B.A. 1966, Yale University; M.D. 1970, University of Pennsylvania

Maya Tolani Karna, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.B., B.S. 1961, M.G.M. Medical College, India

Marie-Louise Levy Kennedy, *Associate Professor of Anesthesiology*
B.S. 1943, College de Ville Franche, De Rouergue, France; M.D. 1952, Strasbourg Medical School, France

Chul Wha Kim, *Assistant Clinical Professor of Anesthesiology*
M.D. 1967, Younsei University, Korea

William A. Knaus, *Professor of Anesthesiology and Research Professor of Computer Medicine*
B.S. 1968, Widener College; M.D. 1972, West Virginia University

Nancy Junghee Kwon, *Assistant Professor of Anesthesiology*
M.D. 1975, Ewha Womans University, Korea

Don Seung Lee, *Associate Professor of Anesthesiology*
M.D. 1966, Catholic Medical College, Korea

Manfred Wilhelm Lichtmann, *Professor of Anesthesiology*
B.S. 1954, Wagner College; M.D. 1973, Thomas Jefferson University

Mollyann Green March, *Assistant Professor of Anesthesiology*
B.A. 1973, Boston University; M.D. 1981, Medical College of Pennsylvania

Paul Mazel, *Professor of Pharmacology and of Anesthesiology*
B.S. 1946, Medical College of Virginia of Virginia Commonwealth University; M.S. 1955, Trinity University; Ph.D. 1960, Vanderbilt University

Willis Alexander McGill II, *Associate Professor of Anesthesiology and of Child Health and Development*
B.S. 1963, Westminster College; M.D. 1967, University of Pittsburgh

Brian Jay McGrath, *Assistant Professor of Anesthesiology*
B.A. 1977, State University of New York at Albany; M.D. 1982, Union University

Gertrud Weber Mergner, *Associate Professor of Anesthesiology*
M.D. 1967, University of Iowa

George Albert Morales, *Professor of Anesthesiology and of Neurological Surgery*
B.S. 1947, M.D. 1951, University of Mexico

Lucille Ann Mostello, *Assistant Professor of Anesthesiology and of Child Health and Development*
B.A. 1966, Seton Hall University; M.D. 1970, Johns Hopkins University

Thomas John Nassif, *Associate Professor of Anesthesiology*
B.A. 1958, West Virginia University; M.D. 1962, University of Pennsylvania

John Stephen Naulty, *Associate Professor of Anesthesiology and of Obstetrics and Gynecology*
B.A. 1968, Duke University; M.D. 1972, Thomas Jefferson University

Honorato F. Nicodemus, *Adjunct Associate Professor of Anesthesiology*
M.D. 1962, Far Eastern University, Manila

Ramesh I. Patel, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.B., B.S. 1975, University of Baroda, India

Murray Michael Pollack, *Associate Professor of Anesthesiology and of Child Health and Development*
A.B. 1970, University of Rochester; M.D. 1974, Yeshiva University

Thomas Gilman Rainey, *Adjunct Associate Professor of Anesthesiology*
A.B. 1970, M.D. 1974, Duke University

Linda Jo Rice, *Assistant Professor of Anesthesiology and of Child Health and Development*
B.S. 1973, M.D. 1977, University of Kentucky

Michael John Shaffer, *Professor of Anesthesiology*
B.S.E.E. 1949, Leeds University, England; M.S. in E.E. 1974, D.Sc. 1981, George Washington University

Mohammad B.G. Shahvari, *Associate Professor of Anesthesiology*
M.D. 1968, Pahlavi University, Iran; M.S. 1973, Temple University

Diane Fones Sim, *Assistant Professor of Anesthesiology*
B.S. 1973, University of Maryland; M.D. 1977, Wake Forest University

John Peter Swope, *Adjunct Associate Professor of Anesthesiology and of Health Care Sciences*
B.S. 1958, U.S. Naval Academy; M.D. 1966, Georgetown University; M.S. 1970, Case Western Reserve University

Susan Thomas Verghese, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.B., B.S. 1975, Christian Medical College, India

Herbert D. Weintraub, *Professor of Anesthesiology*
B.A. 1950, New York University; M.A. 1958, M.B.,Ch.B 1959, Oxford University

Leila Greiss Welborn, *Associate Professor of Anesthesiology and of Child Health and Development*
M.B., Ch.B. 1967, Cairo University, Egypt

John Franklin Williams, Jr., *Assistant Professor of Anesthesiology*
B.A. 1970, Boston University; M.Sc. 1973, London School of Economics and Political Science; M.P.H. 1975, Yale University; M.D. 1979, George Washington University

Jack Evans Zimmerman, *Professor of Anesthesiology and of Medicine*
B.S. 1960, University of Maryland; M.D. 1964, George Washington University

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## Colleges and Schools—Degree Programs

**Columbian College of Arts and Sciences:** Associate in Arts (A.A.), Bachelor of Arts (B.A.), Bachelor of Music (B.Mus.), and Bachelor of Science (B.S.)

**Graduate School of Arts and Sciences:** Master of Arts (M.A.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (M.Mus.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Philosophy (M.Phil.), and Doctor of Philosophy (Ph.D.)

**School of Medicine and Health Sciences:** Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), Master of Public Health (M.P.H.), and Doctor of Medicine (M.D.)

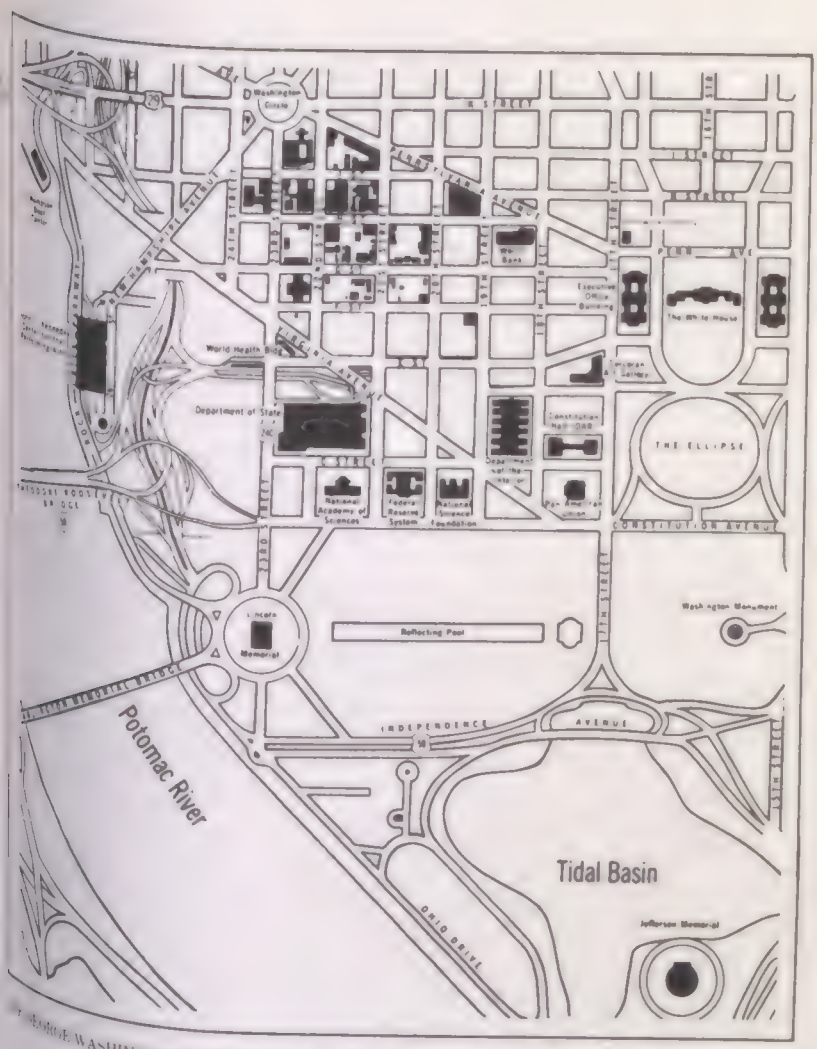
**National Law Center:** Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L. [Am.Prac.]), and Doctor of Juridical Science (S.J.D.)

**School of Engineering and Applied Science:** Bachelor of Science (Civil Engineering) (B.S. [C.E.]), Bachelor of Science (Computer Science) (B.S. [C.S.]), Bachelor of Science (Electrical Engineering) (B.S. [E.E.]), Bachelor of Science (Mechanical Engineering) (B.S. [M.E.]) Bachelor of Science (Systems Analysis and Engineering (B.S. [S.A.&E.]), Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Engineer (Engr.), Applied Scientist (App.Sc.), and Doctor of Science (D.Sc.),

**School of Education and Human Development:** Bachelor of Arts in Education and Human Development (B.A. in Ed.&H.D.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education and Human Development (M.A. in Ed.&H.D.), Master of Arts in Teaching (M.A.T.), Master of Education (M.Ed.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

**School of Government and Business Administration:** Bachelor of Accountancy (B.Acct.), Bachelor of Business Administration (B.B.A.), Master of Accountancy (M.Acct.), Master of Association Management (M.A.M.), Master of Business Administration (M.B.A.), Master of Health Services Administration (M.H.S.A.), Master of Public Administration (M.P.A.), Master of Science in Information Systems Technology (M.S. in I.S.T.), Master of Taxation (M.T.), Master of Urban and Regional Planning (M.U.&R.P.), Specialist in Health Services Administration (Spec. in H.S.A.), and Doctor of Philosophy (Ph.D.)

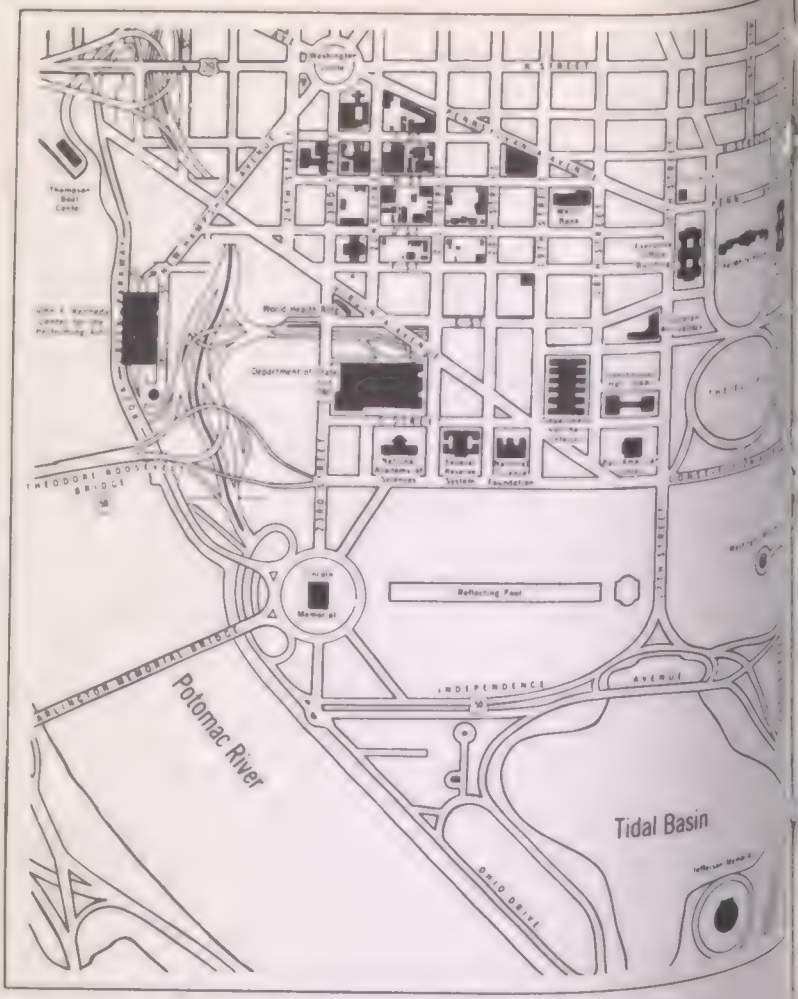
**Elliott School of International Affairs:** Bachelor of Arts (B.A.) and Master of Arts (M.A.)




GEORGE WASHINGTON UNIVERSITY CAMPUS | WASHINGTON D C

# The George Washington University National Law Center Bulletin 1988–1989






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The George Washington University
National Law Center Bulletin
August 1988

Published by The University at Washington, D.C. 20052

The George Washington University

# National Law Center Bulletin
1988–1989

Washington, D.C. 20052

THE GEORGE WASHINGTON UNIVERSITY
NATIONAL LAW CENTER



TO PROSPECTIVE STUDENTS

This Bulletin is designed to provide you with general information concerning the George Washington University National Law Center, including registration, fees, and financial aid, as well as a list of faculty members and courses of instruction. It is difficult in such a book of "facts" to capture the spirit and tradition of friendliness and cooperation among students, faculty, and staff that characterizes the law school and provides a superb environment for study.

If you join us as a first-year student, you will soon discover that the first year of the school is an intense one. You will be assigned to a section that will become a little community of its own, with a camaraderie and esprit de corps that will make that first year one of the most vivid of your life.

As an advanced J.D. or LL.M. student, your time here will be one of intellectual growth. In your upper-class years, you may choose to take one of the many courses and programs in fields, such as Administrative Law, Constitutional Rights, Government Contracts, International Law, Labor Law and Antitrust Law, Land Development Law, Patent Law, or Taxation, which have given this school its reputation as a center for study and research in public law. Graduate students may choose to specialize in one of these areas just mentioned. As a J.D. student in your upper-class years, you might also choose to direct your energies to the school's varied and intense programs in Clinical Law.

Our physical environment strongly complements our academic program. Just a few years ago, we completed a major expansion and renovation that has produced a handsome, well-integrated building designed to encompass all necessary aspects of law school activity.

It should be evident that the National Law Center is a large, dynamic place, with a strong sense of community, in which the study of law is both enjoyable and stimulating.

Cordially,

Jack H. Friedenthal

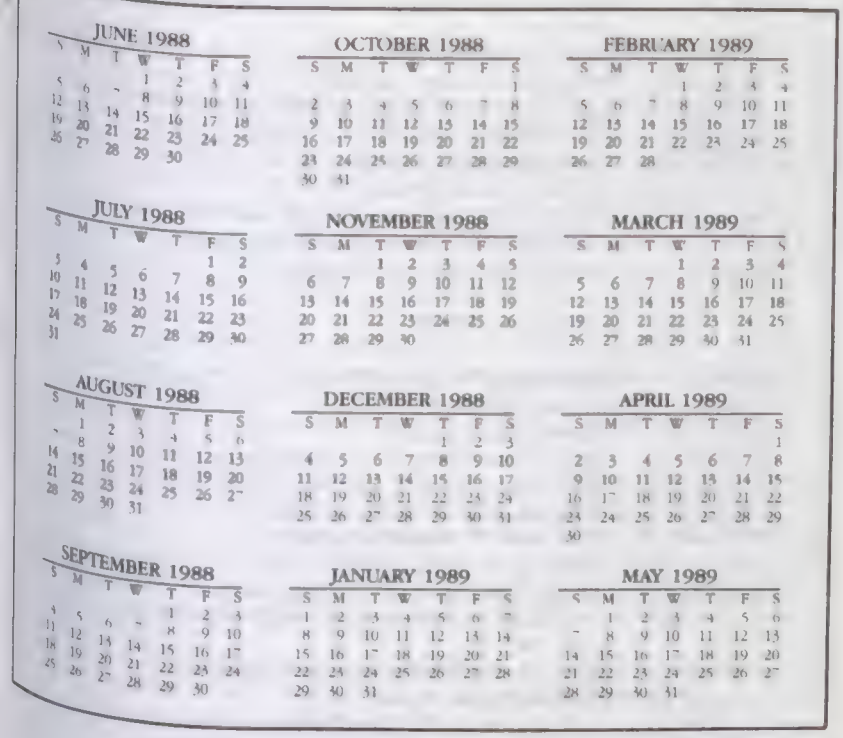
Jack H. Friedenthal
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# THE CALENDAR 1988–1989*



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| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | | | |

**SEPTEMBER 1988**

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**OCTOBER 1988**

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| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | 31 | | | | | |

**NOVEMBER 1988**

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**DECEMBER 1988**

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**JANUARY 1989**

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| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | | | | |

**FEBRUARY 1989**

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| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | | | | |

**MARCH 1989**

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| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 | |

**APRIL 1989**

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| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
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**MAY 1989**

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| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | | | |

## 1988 SUMMER TERM

*May 23* Registration for all sessions *Monday* (noon–6 p.m.)
Application for September graduation due as part of registration
First-session and 13-week session classes begin

*May 30* Holiday *Monday*

*June 29* First-session classes end *Wednesday*

*June 30, July 1* First-session examination period *Thursday–Friday*

*July 1* Application for September graduation due

*July 4* Holiday *Monday*

*July 6* Registration *Wednesday* (9:30 a.m.–2 p.m. and 4–6 p.m.)
Second-session classes begin

*August 12* Last day of classes *Friday*
LL.M. theses of September candidates due

*August 15–17* Second-session and 13-week session examination period *Monday–Wednesday*

*The Academic Calendar is subject to change

| 1988 | FALL SEMESTER |
|---|---|
| *August 18–19* | Registration *Thursday* (12:30–7 p.m.) and *Friday* (2–6 p.m.) |
| *August 22* | Classes begin *Monday* |
| *September 5* | Labor Day (holiday) *Monday* |
| *October 1* | Application for February graduation due |
| *October 7* | S.J.D. dissertations of February candidates due *Friday* |
| *November 24–25* | Thanksgiving holiday *Thursday–Friday* |
| *November 28* | Classes resume *Monday* |
| *December 2* | Last day of fall-semester classes *Friday*<br>LL.M. theses of February candidates due |
| *December 3–16* | Reading and examination period |

| 1989 | SPRING SEMESTER |
|---|---|
| *January 5–6* | Registration *Thursday* (12:30–7 p.m.) and *Friday* (10 a.m.–2 p.m.) |
| *January 9* | Classes begin *Monday* |
| *January 16* | Martin Luther King Day (holiday) *Monday* |
| *January 19* | S.J.D. dissertations of May candidates due *Thursday* |
| *January 20* | Inauguration Day (holiday) *Friday* |
| *February 1* | Application for May graduation due |
| *February 19* | Winter Convocation *Sunday* |
| *February 20* | George Washington's birthday observed (holiday) *Monday* |
| *April 15* | Completed applications for 1989–1990 teaching fellowships due |
| *March 10* | Spring recess begins after last class *Friday* |
| *March 20* | Classes resume *Monday* |
| *April 27* | LL.M. theses of May candidates due *Thursday*<br>Last day of spring-semester classes *Thursday* |
| *April 28–May 11* | Reading and examination period |
| *May 21* | Commencement *Sunday* |



# THE NATIONAL LAW CENTER

## HISTORY

The Law Center, the oldest law school in the District of Columbia, was established in 1865 with a formal program of two years of study. This was largely through the efforts of the Reverend Whitefield Samson, President of Columbian College, whose action resulted in the purchase of a separate building for holding law classes. The building had belonged to Trinity Church, of which Francis Scott Key had been Senior Warden. It was occupied by the Law Center until 1884.

Sixty graduates, from 22 of the then 37 states, received degrees in 1867. The school continued to have a student body and a faculty that reflected the fact that it was at the seat of our nation's government. Supreme Court Justices David J. Brewer and John Marshall Harlan were among the prominent members of the bench and bar who were on the faculty.

In 1877, one year after the first such program was adopted in the United States, the Law Center instituted a course leading to the degree of Master of Laws. In 1898, the course of instruction for the degree of Bachelor of Laws was extended to three years. The Law Center took part in 1900 in the organization of the Association of American Law Schools.

In the past quarter-century the Law Center expanded its course and seminar offerings with consideration of the needs of first-degree and graduate students. The degree of Doctor of Juridical Science was instituted in 1940. The need of foreign lawyers who came to this country and who required additional preparation for law work in the United States resulted in the creation of programs for the degrees of Master of Comparative Law in 1946 and Master of Comparative Law (American Practice) in 1951.

In 1954, the National University School of Law, which had held an important place in legal education in the District of Columbia since 1869, was absorbed by the George Washington University Law School.

Since 1954, programs of special research and study have enriched the basic curriculum. At present these include Taxation; Labor Law; Environmental and Energy Law; Patent Law; International and Comparative Law; and Government Contracts. The academic courses reflect the breadth in public law for which the Law Center is well known.

Additionally, the Law Center has been a leader in developing a curriculum to meet the legal needs of the poor and the disadvantaged. The clinical law program is the equal of that at any law school in the nation. Special projects include the Consumer Protection Center, the Community Legal Clinic, Clinical Studies in Environmental Law, Students in Court, and individual projects supervised by the Law Students Civil Rights Research Council.

Realizing the need for legal services for all members of society, the National Law Center, while maintaining its strong course offerings in patent law, administrative law, taxation, and government contracts, has developed a rich selection of courses, traditional and clinical, oriented toward the needs of the poor, the elderly, and the consumer.

## UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University,

including admission to educational programs and employment. The University is also subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Dr. Marianne Phelps, Associate Provost, George Washington University, Rice Hall, Washington, D.C. 20052, (202)994-6508, or to the Assistant Secretary for Civil Rights of the Department of Education.

## LOCATION IN THE NATION'S CAPITAL

Of special significance is the location of the National Law Center in the nation's capital, the focal point of the law in action, both American and international. The work of the Center goes on in this environment, presenting a unique opportunity for observation and study of federal agencies—judicial, legislative, and administrative. Readily accessible are the Supreme Court of the United States, the federal trial and appellate courts of the District of Columbia, and federal courts of special jurisdiction, such as the United States Court of Appeals for the Federal Circuit, the United States Tax Court, and the Court of Military Appeals. Current federal legislation can be studied as it is considered by Congressional committees and as it comes up for debate on the floors of the House of Representatives and the Senate. With respect to the federal administrative agencies, students here in Washington have matchless opportunities for study and observation. They can attend informal and formal hearings of these agencies and can obtain from the docket sections complete records of administrative adjudication in specific cases. Illustrative of such federal agencies are the Interstate Commerce Commission in the field of transportation; the Federal Trade Commission in the field of trade regulation; the Securities and Exchange Commission in the field of security issues and corporate finance; the National Labor Relations Board in the field of labor–management relations; the United States Patent Office in the field of patent law; the Federal Energy Regulatory Commission in the field of water, natural gas, and electric power; and the Federal Communications Commission in the field of radio and television.

Supplementing these environmental advantages of law in action are the exceptional research library collections in the Library of Congress, in the various departments of the federal government, and in the libraries of the headquarters of national and international organizations. The notable library of the Carnegie Foundation for International Peace has been acquired by George Washington University for use by research students in international and comparative law, fields with respect to which Washington has come to be called "The Capital of the World."

The years of residence at law school are years of participation in the life of the community, which in the case of the George Washington University National Law Center is the government of the United States. As a consequence, the study of law takes on added meaning, whether the goal be government service or practice, general or specialized, and whatever the community in which the student plans to practice.

## ENRICHMENT PROGRAM

The Law Center supplements and enriches its diverse law programs by bringing to the school eminent legal scholars, judges, distinguished members of the bar, members of Congress, and high-level government officials to offer lectures and informal seminars with students and faculty. Participants in the Enrichment Program have included columnist Anthony Lewis, Supreme Court Justices Antonin Scalia, Sandra Day O'Connor, and Harry Blackmun, CIA Director William Webster,



Senator Bill Bradley, U.S. Attorney Rudolph Giuliani, Dean Guido Calabresi of Yale Law School, Judge Richard Posner of the U.S. Court of Appeals for the Seventh Circuit, and Professor Ronald Dworkin of Oxford University. The Enrichment Program, funded largely by gifts from alumni and friends of the Law Center, includes several endowed lectureships and a visiting scholar program.

## OBJECTIVES

The purpose of the National Law Center is to prepare men and women to meet the needs of society in many fields of law and to encourage scholarly research and writing in the law. As a national law school, the Center does not emphasize any particular geographic area in its instruction; therefore, it prepares students to practice law in any part of the country. The Center also offers a program of legal education for foreign students. The Law Center seeks to fulfill these objectives through (1) a rich and varied curriculum taught by eminent professors and highly qualified specialized instructors; (2) an extensive clinical law program in which students learn legal skills by actual practice; (3) two law journals which specialize in public law and international law; (4) trial practice; (5) participation in the Van Vleck Appellate Case Club and several other moot court competitions; (6) a series of student professional co-curricular activities; (7) studies on an advanced level for foreign as well as for American students; (8) a continuing legal education program for members of the bar, providing them with opportunities for course work within the curriculum; and (9) scholarly research and writing in the law.

## THE NATIONAL LAW CENTER COMPLEX

A $10,- million expansion program of the physical facilities of the National Law Center has been completed. The new complex includes the new teaching facility Lerner Hall, a completely renovated Stockton Hall, and the expanded Jacob Burns Law Library. The facade of the new National Law Center is imaginative and integrates a collection of dissimilar buildings into a visual unit. The Center has become a positive addition to the campus, the street, and the neighborhood.

### Lerner Hall

Theodore N. Lerner Hall is one of the most modern and innovative law teachi facilities in the nation. Its five levels contain eight major classrooms, the Dean's suite, and the Moot Court room. Four of the classrooms are constructed in an theater style and provide a full range of vision from any seat in the room. Th amphitheater classrooms are equipped with the most advanced sound systems and have full video and viewing capacities.

Lerner Hall is a contemporary version of Victorian architecture. It has bee described by the *The Washington Post* as "a progressive piece of architecture an urban design."

### Stockton Hall

The newly renovated Stockton Hall contains administrative offices, student lounge and legal clinics. It also holds a reading room, media center, classrooms, and faculty offices.

### The Jacob Burns Law Library

The parameters of the Jacob Burns Law Library have been thoroughly altered by the building expansion. The collections, study areas, and library administrative offices are now located on five instead of eight floors, and a large reading room spanning the entire second floor of Stockton Hall connects Lerner Hall directly to the library. The number of study spaces, at library tables and carrels and in group study rooms and cubicles, has been greatly increased, and lounge areas are available within and close to the library.

The use of a law library is inherently different from the uses of most other libraries. A law library is often likened to the scientist's laboratory. Most law books are used briefly on the premises rather than checked out for thorough reading. Law students spend many of their waking hours in the library, using books or other research facilities. Care has therefore been taken in making the Jacob Burns Law Library not only efficient but beautiful and comfortable.

The collection numbers about 400,000 volumes. It contains a comprehensive research library, often in multiple copies, of Anglo-American law, including the annotated statutes of the federal government, the 50 states, the territories, and other common-law countries as well as the reported decisions of all these jurisdictions in all editions. The library is especially strong in administrative and regulatory material and congressional coverage. It was designated a United States Government Depository Library in 1978 and is, through this program, acquiring a substantial government documents collection.

The extensive treatise collection covers not only the field of law but law-related disciplines such as business, finance, economics, labor relations, sociology, criminology, psychology, political science, biography, foreign affairs, environmental studies, and others. Especially strong collections are maintained for tax law, labor law, intellectual property law, and international law. A portion of the holdings of the former Library of the Carnegie Endowment of International Peace, acquired by the University in 1950, has been incorporated into the library. Another especially rich component is the periodical collection. A growing proportion of these research materials is collected in a variety of microformats or on audio- or videotapes. In addition to the materials available in-house, the library can gain access to almost unlimited information sources of a legal or law-related nature through the various computer databanks to which it subscribes, such as LEXIS, WESTLAW, ELSS (Electronic Legislative Search System), Legi-Slate, Dialog, Nexis, and VU/TEXT.

A permanent staff of 27 persons and many part-time employees administers and maintains the library and offers information, instruction, and other research support services. *Jacob Burns Law Library Readers' Guide*, available at the information desk, lists library services, hours of operation, collection locations, and other library-related information.

Beyond the resources of the Jacob Burns Law Library, GWU law students have access to the George Washington University Library (Gelman), the Medical Library (Himmelfarb), and other famous libraries in the District of Columbia, including the Library of Congress.

## THE JURIS DOCTOR DEGREE PROGRAM

### ENTRANCE REQUIREMENTS

For information on application for admission to the Juris Doctor degree program, see Admission under General Information. Admission to candidacy for the degree of Juris Doctor requires a Bachelor of Arts or equivalent degree from an accredited college or university, a satisfactory quality of work, and an acceptable distribution of courses. Any substantial number of hours taken on a pass–fail or other ungraded basis may be seriously detrimental to an applicant's chances for admission. Eligibility is based on personal and scholastic records and on the result of the Law



School Admission Test. Personal recommendations by the faculty, as well as t benefits the school derives from social, ethnic, cultural, and geographical diversi among its students, are considered. No applicant will be acceptable in transfer w is ineligible to return in good standing to a previously attended law school. Fro the applicants, a selection is made by the Committee on Admissions.

Information concerning the Law School Admission Test may be obtained from the Admissions Office of the National Law Center or from the Law School Admissio Services, Box 2000, Newtown, Pa. 18940. The test is administered at various center in the United States. Testing dates are usually in October, December, February, an June. Completed application forms and fees must be received by the Law Schoo Admission Services at least four weeks before the date of the test. It is not necessary that formal application for admission be made prior to taking the test.

### Advanced Standing

In unusual circumstances, advanced standing toward the degree of Juris Doctor may be granted for work of high quality successfully completed in other law schools that are members of the Association of American Law Schools or are approved by the American Bar Association. Transferred credits will not be recognized in excess of 28 credit hours.

Advanced standing will not be granted for law work already counted toward the Bachelor of Arts or other pre-legal degree.

## TUITION DEPOSIT

Every student admitted to the National Law Center as a candidate for the degree of Juris Doctor must submit a nonrefundable tuition deposit ($100 initially plus $350 later) after receipt of notification of acceptance. This deposit is credited toward tuition.

## PROFILE OF THE ENTERING CLASS, FALL 1987

A first-year class of 425 students was selected from approximately 5,000 applicants from more than 700 colleges and universities. Applications were received from every state in the union. Forty-six percent of the first-year class were women.

The following colleges and universities are each represented by three or more members of the first-year class: American University, Boston College, Boston University, Brandeis University, Clark University, Colgate University, College of the Holy Cross, College of William and Mary, Connecticut College, Cornell University, Dartmouth College, Denison University, Dickinson College, Duke University, Emory University, Franklin and Marshall College, George Washington University, Georgetown University, Lafayette College, Pennsylvania State University, Rensselaer Polytechnic Institute, Rutgers University, State University of New York at Albany, State University of New York at Binghamton, State University of New York at Stony Brook, Syracuse University, Tufts University, Tulane University, Union College (New York), U.S. Merchant Marine Academy, University of California, Berkeley, University of California, Los Angeles, University of Delaware, University of Florida, University of Illinois, University of Maryland, University of Massachusetts, University of Michigan, University of Notre Dame, University of Pennsylvania, University of Rochester, University of Vermont, University of Virginia, University of Washington, Vassar College, Washington University, Wellesley College.

## THE CURRICULUM

The curriculum for the degree of Juris Doctor at the National Law Center offers the candidate one of the largest and most varied selections of courses in the country. First-year students are required to take Civil Procedure; Constitutional Law I; Contracts; Criminal Law; Legal Research and Writing; Moot Court; Property; and Torts. These courses give students the basis upon which all further legal study is built. In the second and third years of study, students must take Constitutional Law II, Criminal Procedure, Evidence, Professional Responsibility and Ethics, the perspective requirement outlined below, and the two-credit legal writing requirement.

All students are required to take one of the following legal perspective courses during their program of study: American Legal History; Comparative Labor Law Seminar; Comparative Law; The Crime Lab, the Forensic Scientist, and the Criminal Lawyer; Jurisprudence; Law and Criminology I or II; Law and Medicine; Law and Psychiatry; The Legal Process; Law and Economics; Law, Science, and Technology; United Nations Law and World Order; Comparative Environmental Law.

Beyond these requirements, students are free to choose from the many course and project offerings. The Law Center prides itself on allowing students freedom to design their own program of study.

The curriculum is organized so that students may begin the study of law for the Juris Doctor degree only at the start of the fall semester. Transfer students may enter at the start of the spring semester also.

## DAY DIVISION

**First Year**

| Fall Semester | | Spring Semester | |
|---|---|---|---|
| Contracts I | 3 | Contracts II | 3 |
| Torts | 4 | Property | 4 |
| Criminal Law | 3 | Constitutional Law I | 3 |
| Civil Procedure I | 3 | Civil Procedure II | 3 |
| Legal Research and Writing | 2 | Moot Court | 1 |
| Total semester hours | 15* | Total semester hours | 14 |

**Second Year**

| Fall Semester | | Spring Semester | |
|---|---|---|---|
| Constitutional Law II | 3 | Evidence | 4 |
| †Elective | 11 | Elective | 10 |
| Total semester hours | 14 | Total semester hours | 14 |

**Third Year**

| Fall Semester | | Spring Semester | |
|---|---|---|---|
| †Elective | 12 | Elective | 14 |
| ‡Legal writing requirement | 2 | | |
| Total semester hours | 14 | Total semester hours | 14 |

*Students may elect to take 13 hours in one of their upper-class semesters.

†In the second or third year, students must complete Law 222, *Professional Responsibility and Ethics*, Law 217, *Criminal Procedure*, and the perspective requirement above.

‡This requirement may be satisfied by service on the *Law Review*, by service on the *Journal of International Law and Economics*, by satisfactory completion of a seminar and other courses that require a research paper, by participation in upper-class Moot Court, or by satisfactory completion of Law 314, *Legal Writing*.

## EVENING DIVISION

**First Year**

| Fall Semester | | Spring Semester | |
|---|---|---|---|
| Contracts I | 4 | Contracts II | 3 |
| Torts | 4 | Criminal Law | 4 |
| Legal Research and Writing | 2 | Property | 3 |
| | | Moot Court | 0 |
| Total semester hours | 10 | Total semester hours | 10 |

**Second Year**

| Fall Semester | | Spring Semester | |
|---|---|---|---|
| Constitutional Law I | 3 | Constitutional Law II | 3 |
| Civil Procedure I | 3 | Evidence | 3 |
| *Elective | 4 | Civil Procedure II | 4 |
| Total semester hours | 10 | Total semester hours | 10 |

**Third Year**

| Fall Semester | | Spring Semester | |
|---|---|---|---|
| *Elective | 8 | Elective | 8 |
| †Legal writing requirement | 2 | | |
| Total semester hours | 10 | Total semester hours | 10 |

**Fourth Year**

| Fall Semester | | Spring Semester | |
|---|---|---|---|
| *Elective | 10 | Elective | 10 |
| Total semester hours | 10 | Total semester hours | 10 |

| Summer Term or Ninth Semester | |
|---|---|
| Elective | 4 |

## REQUIREMENTS FOR THE DEGREE

The student must have completed a residence period of three academic years (four years for evening students) and 84 semester hours of required and elective courses with a cumulative average of at least 65. At least two academic years of residence and 56 semester hours are required of students admitted with advanced standing. A student must be registered at the National Law Center for the final semester or summer session preceding graduation. Credits allowed for advanced standing are not included in computing the average required for graduation.

### Residence

Candidates for the Juris Doctor degree must complete a residence period of three academic years. Attendance in the day division for the fall and spring semesters constitutes residence for an academic year; similar attendance in the evening division constitutes residence for three-fourths of an academic year. Consequently,

*Students may elect to take 13 hours in one of their upper-class semesters.
†In the second or third year, students must complete Law 222, *Professional Responsibility and Ethics*, Law 217, *Criminal Procedure*, and the perspective requirement above.

a day student must attend six semesters to meet residence requirements; an evening student must attend eight. Students authorized to take schedules of less than 10 hours in the day division or less than six hours in the evening division receive residence credit on a proportional basis. Students who attend the summer sessions receive fractional residence credit. These residency requirements apply to all J.D. students in the National Law Center.

## HONORS

The degree of Juris Doctor "With Highest Honors" is awarded to those students, not exceeding three percent of the graduating class, who have obtained the highest cumulative averages of at least 85 or better.

The degree of Juris Doctor "With High Honors" is awarded to those students with the highest cumulative averages of 80 or better. The number of students receiving degrees "With High Honors," when added to the total number of students receiving degrees "With Highest Honors," may not exceed 10 percent of the graduating class.

The degree of Juris Doctor "With Honors" is awarded to those students with the highest cumulative averages of 75 or better. The number of students receiving degrees "With Honors," when added to the total number of students receiving degrees "With High Honors" and "With Highest Honors," may not exceed 40 percent of the graduating class.

## ORDER OF THE COIF

The Order of the Coif, a national legal honor society, aims "to foster a spirit of careful study and to mark in a fitting manner those who have attained a high grade of scholarship." The George Washington University Chapter was established in 1926. Members are elected each year from the highest-ranking 10 percent of the graduating Juris Doctor candidates. Only students who have completed their full course of study at the National Law Center are eligible for membership.

## PUBLICATIONS

The *George Washington Law Review*, published five times a year, is edited and managed by the students of the National Law Center. The *Law Review* is known for its emphasis on federal and public law; however, it is also devoted to research in other important legal areas. The staff of the *Law Review* is selected on the basis of a writing competition and on the basis of grades. The editorial board is selected from those students who have successfully completed the first year of *Law Review* work. Students receive 4 semester hours of academic credit for the two-year program.

The George Washington *Journal of International Law and Economics*, managed and edited by law students, is a publication of the Law Center. It presents articles and commentaries on public and private international financial development, comparative law, and international law. The staff of the *Journal* is selected on the basis of grades and a writing competition, and students earn academic credit for their work.

## MOOT COURT

The moot court competitions and programs provide realistic training in appellate and trial advocacy. The Moot Court Board, which administers moot court programs at the National Law Center, is a student organization dedicated to promoting excellence in written and oral advocacy. The Board assists the faculty in administering the moot court program for the first-year class and sponsors the Van Vleck



Appellate Moot Court Competition, the Jessup Cup competition in international law, the Giles S. Rich competition in patent law, and the Student Trial Lawyers Association trial competition. In addition, the Board sends student teams to interscholastic competitions across the nation.

## LAW CENTER ORGANIZATIONS

**The Advocate**—The student newspaper of the National Law Center features articles by faculty and students on school news and current legal topics.

**Asian–Pacific American Law Student Association**—A national organization that serves the needs and concerns of Asian–Pacific Americans.

**Black Law Student Association**—A national organization that has chapters at some 80 law schools and sponsors speakers and programs.

**Christian Legal Society**—An association centered around the role of Christianity in the legal profession.

**Environmental Law Association**—An organization of students interested in issues of the environment and natural resources. ELA sponsors speakers and publishes a quarterly newsletter featuring articles by students and faculty.

**Equal Justice Foundation**—Founded by Ralph Nader to encourage action in public interest law among students and practicing attorneys. The GWU chapter provides summer stipends for law students needing support for low-paying and volunteer legal work. The foundation also sponsors speeches, films, and presentations.

**Federalist Society**—An organization concerned with evaluating areas of the law, primarily constitutional law, in light of the works of the Federalists.

**International Law Society**—An organization of students that sponsors speakers and various programs.

**Jewish Law Student Association**—An association that sponsors a variety of speaker programs, including a Sunday brunch speaker series.

**Law Association for Women**—An organization committed to studying and furthering women's issues in the legal profession.

**Law Fraternities and Sororities**—The National Law Center chapters of Delta Theta Phi, Phi Alpha Delta, and Phi Delta Phi sponsor speakers and various social occasions.

**Law Students Civil Rights Research Council**—A national organization concerned with the legal problems of civil rights. LSCRRC offers clinical law projects for which students may receive academic credit.

**Moot Court Board**—Activities of the Moot Court Board are described in the preceding section. Membership is composed of students who have demonstrated outstanding ability in one of the board's advocacy competitions.

**Movimiento Legal Latino**—A national organization that has chapters at various law schools and sponsors speakers and various programs.

**National Lawyers Guild**—An association designed to bring together those members of the law community committed to broad issues of social reform.

**Student Bar Association**—The law student governing body, which is responsible for allocating funds among the various student organizations and conducts a speaker program for the law school. All members of the student body are members of the Student Bar Association.

**Student Intellectual Property Law Association**—An organization of students interested in patent, trademark, copyright, and related law. The Association conducts an extensive speakers program as well as various social events.

**Student Trial Lawyers Association**—A forum for students interested in trial advocacy and issues of trial law.

**Women's Rights Committee**—With primary interest in the place of women in law schools and in the legal profession, WRC conducts seminars and sponsors speakers.

## JOINT JURIS DOCTOR–MASTER'S DEGREE PROGRAM

In certain instances, arrangements may be made for students to work concurrently toward both the Juris Doctor degree in the National Law Center and a master's degree in some fields in the University's Graduate School of Arts and Sciences, School of Government and Business Administration, or Elliott School of International Affairs. Fields in which this program is available include business administration, economics, international affairs, political science, and public administration. Students must be admitted both to the National Law Center and, separately, to the school that will confer the master's degree and must meet all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

## MASTER'S AND DOCTORAL PROGRAMS

The administration of justice under law is a matter so vast and complex that some who hold the Bachelor of Laws or Juris Doctor degree feel the need for further study. The master's and doctoral programs give students the opportunity to broaden and deepen their understanding of the law.

The Master of Laws candidate may follow a program of general study or concentrate in one of the specialized areas listed below. Courses in each of these areas are included in the 501–600 series. (Some courses in these areas are included in the 401–499 series.) Graduates who complete their work in one of these areas may have the field of specialization noted on their diplomas.

Administrative Law: Economic Regulation
Corporation Law
Environmental Law
Government Procurement Law
International and Comparative Law
Labor Law
Land Use Management and Control
Patent and Trade Regulation Law
Taxation

Programs leading to the degree of Doctor of Juridical Science offer a limited number of unusually talented advanced students, who have already earned the Master of Laws degree, the opportunity to concentrate on research and writing in a specific area of interest to the legal profession.

## MASTER OF LAWS

### Entrance Requirements

A Bachelor of Laws, Juris Doctor, or equivalent degree from a law school that is a member of the Association of American Law Schools or is approved by the American Bar Association is required. The applicant must have demonstrated a high degree of academic excellence. Advanced standing is not granted for credits earned while a candidate for the first degree in law or for credits earned at other law schools.

### Degree Requirements

The student must complete a residence period of not less than two semesters, which should be continuous. All requirements for the degree must be completed in this Law Center and in a period not exceeding three years from the time of initial graduate registration, unless an extension is granted in writing by the Dean. The student must complete 24 semester hours of courses and writing projects with acceptable grades. For all courses taken within the Law Center a student must attain the grade of 65 or above. For approved courses taken outside the Law Center, the grade of either *CR* (Credit) or *NC* (No Credit) is assigned. To receive the grade of *CR*



in a course taken in other graduate divisions of this University, a student is required to attain the grade of *B* or better. To receive the grade of *CR* in a course taken at Georgetown University through the Consortium of Universities of the Washington Metropolitan Area, Inc., a student is required to attain the grade of *C* or better. A minimum cumulative average of 78 is required at all times for all LL.M. candidates. The student is expected to include Law 599–600 *Thesis* in the 24-semester-hour requirement for the degree (for exception, see Master's Thesis, below).

Candidates for the degree in a selected field of specialization must complete a minimum of 12 of the required 24 semester hours in courses and writing projects related to the selected field.

The only credit hours that may be applied to any Post-J.D. degree are those completed while a duly enrolled candidate for that specific degree, with the following exceptions: (1) an unclassified student who has been admitted with the specific right to convert to degree status at the end of a specified number of hours, and (2) S.J.D. candidates who have fulfilled the 8-hour course requirement as unclassified students.

### Master's Thesis

Each candidate for the degree of Master of Laws is expected to write a master's thesis (Law 599–600) under the supervision of a full-time member of the faculty of the National Law Center. Four hours of credit will be granted for successful completion of the thesis. The purpose of this requirement is to demonstrate the ability of the student to perform research in a special area of the law and to produce a scholarly paper containing the results of this research. The thesis is expected to be of substantially the same quality as a law review article. The Dean may waive the thesis requirement upon written request of the student, submitted no later than the beginning of the final semester or summer session before the student's graduation, but only if the student has demonstrated research and writing ability by taking a minimum of 6 semester hours of course work at the National Law Center designated "Research Paper." No thesis waiver will be granted for candidates for the degree of Master of Laws with specializations in international law or government procurement law.

The thesis in its final form must be presented to the adviser no later than the date specified in the Calendar. Two complete copies are required. It is the responsibility of the candidate to obtain from the Post-J.D. Programs Office a printed copy of the regulations governing the styling and reproduction of theses. The mandatory thesis binding fee of $15 must be paid at the time of registration for the last semester's work.

Accepted theses become the property of the University and are placed in the University's Gelman Library and the Jacob Burns Law Library, where the duplicate copies are bound and made available for circulation.

### Honors

The degree of Master of Laws "With Highest Honors" is awarded students who obtain a minimum cumulative average of 85.

### Graduate Courses in Other Departments

Master of Laws candidates may be permitted to take graduate courses related to their fields of interest in other departments of this University. A maximum of 6 semester hours will be credited toward the degree for such courses; however, credit will be granted only if the courses are given on campus. The grade of *CR* (Credit) or *NC* (No Credit) will be recorded for such courses. Courses numbered 101–200 may be taken for graduate credit only if the student receives the approval

of the instructor at the time of registration and does additional work, as prescribed by the department offering the course.

### Consortium of Universities of the Washington Metropolitan Area, Inc.

A candidate for the Master of Laws degree may take graduate courses at Georgetown University Law Center through the Consortium of Universities of the Washington Metropolitan Area, Inc. A maximum of 6 semester hours of such courses may be credited toward the master's degree. Permission to take Consortium courses must be granted by the Dean, the Registrar, and the instructor offering the course. The grade of *CR* (Credit) or *NC* (No Credit) will be recorded for such courses. To receive the grade of *CR* a student must attain a grade of *C* or higher.

## DOCTOR OF JURIDICAL SCIENCE

### Entrance Requirements

Admission to candidacy for the degree of Doctor of Juridical Science requires a Bachelor of Arts or equivalent degree from an approved college or university, a Bachelor of Laws, Juris Doctor, or equivalent degree, earned with high rank, from a law school that is a member of the Association of American Law Schools or is approved by the American Bar Association; a Master of Laws degree with high academic standing; outstanding capacity for scholarly work in the field of law; and faculty approval of the applicant's dissertation topic. Applicants must also demonstrate their writing ability by submitting the master's thesis or a copy of one or more papers or articles that the applicant has written. Following consultation with the Dean, the applicant must obtain a faculty adviser, to be designated committee chairman, from the regular, full-time faculty; reach agreement on the acceptability of the proposed topic for the dissertation; and submit a detailed outline for the adviser's approval, indicating by chapter and division within chapter the exact scope of the project. There should be a bibliography for each chapter, listing books, reports, cases, and law review articles to be considered. Although the outline cannot predict every detail of the subsequent research, it must be sufficiently definite to afford the Graduate Board a basis for evaluation.

Once the outline is approved, the applicant's committee is expanded to three members; this consultative committee must recommend the acceptance of the applicant to the full Graduate Board. The Board then acts upon the recommendation and may either accept or reject the applicant as an S.J.D. candidate. In no instance will any applicant be admitted to degree candidacy prior to the above procedures; however, the applicant may be registered as an unclassified student for purposes of course work requirements (see below). Approval for degree candidacy must be received within one year of the appointment of an adviser unless a written extension is granted by the Dean.

### Degree Requirements

The candidate must complete (1) a residence period of not less than one academic year; (2) a course of study and research—designated by the consultative committee and approved by the Graduate Board—of no less than 8 semester hours including Jurisprudence, unless previously taken; and (3) an acceptable dissertation. The dissertation must be submitted no later than three years from the date of admission to candidacy for the S.J.D. degree. The applicant who proposes to write on a comparative law topic must have a reading knowledge of the language in which the relevant materials are to be found. When the dissertation is submitted, the consultative committee will set the date for an oral examination. This examination is

conducted by the consultative committee and such other members of the faculty and qualified experts as are selected by the Graduate Board.

No later than the date specified in the Calendar, the candidate must submit to the Dean two complete copies of the dissertation and two copies of an abstract (not to exceed 600 words) of the dissertation.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation and preparation of the abstract are available in the Office of the Dean. To be acceptable the dissertation must, in the opinion of the examining committee, constitute a substantial contribution to the field of law concerned and be suitable for publication. Additional information will be supplied by the Dean. Accepted dissertations become the property of the University and are placed in the University's Gelman Library and the Jacob Burns Law Library, where the duplicate copies are bound and made available for circulation.



## DEGREE PROGRAMS FOR INTERNATIONAL STUDENTS

The National Law Center has several programs of study available to students trained in law outside the United States. These programs fall into two general categories: those directed toward preparing students for a bar examination in an American jurisdiction and those that enable students to return to their countries with a more thorough understanding of some aspects of American law.

A student with a degree from a foreign law school who has met the extremely competitive admissions criteria will be admitted to the Law Center as a candidate for the Master of Comparative Law (M.Comp.L.) or Master of Comparative Law (American Practice) (M.Comp.L. [Am.Prac.]) degree.

To prepare for admission to the bar of an American jurisdiction, the student may apply for either the Juris Doctor or the Master of Comparative Law (American Practice) degree. The J.D. degree requires 84 semester hours of work in law school (credit is given for work in a foreign law school only in exceptional circumstances) and will qualify the student to take most U.S. bar examinations. The M.Comp.L. (Am.Prac.) degree requires 32 semester hours of work and satisfies the requirements of the District of Columbia Bar. *Students are cautioned to ascertain the requirements of the bar for which they intend to qualify prior to selection of their law school programs.*

International students planning to return to their home countries may undertake a program leading to the degree of Master of Comparative Law (Foreign Practice). This degree program enables the student to gain a broad comprehension of the American legal system by taking basic courses in the Law Center. However, it is not intended to qualify a student to take a U.S. bar examination. Courses taken by unclassified students will not be certified for bar admission purposes unless specific arrangements have been made prior to a student's registration in unclassified status.

## ADMISSION PROCEDURE

Application must be received from international applicants no later than June 1 for the fall semester (March 1 for candidates for the Juris Doctor degree), October 1 for the spring semester, and March 1 for the summer sessions.

### Required Records

Applicants must request all educational institutions attended to send directly to the Dean official credentials listing subjects studied, grades received, examinations taken, and degrees received. Original diplomas, certificates, and transcripts from secondary schools and all colleges and universities attended are required, but in exceptional cases certified copies will be accepted. Records of state examinations and certificates are also needed. All records become the property of the University and *cannot* be returned.

### Language Test

Students whose native tongue is not English are required to take the *Test of English as a Foreign Language* and attain as an absolute minimum the score of 600 to be considered for admission to the National Law Center. This is a mandatory requirement. Students are responsible for making arrangements for taking the test and should address inquiries to TOEFL, Educational Testing Service, Princeton, New Jersey 08541, U.S.A. The completed application form should be returned to the Testing Service at Princeton well in advance of the beginning of the semester for which the applicant seeks admission. The test fee, which should be remitted with

the application, entitles the student to have the test score sent to three different institutions. Registration for the *Test of English as a Foreign Language* does *not* constitute application for admission to George Washington University.

The Bulletin of Information, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test; lists of examination centers; examination dates; and an application blank. On the application for the test, the student should specify that the scores be sent to the Dean's Office.

## ENTRANCE REQUIREMENTS

*For the Degree of Juris Doctor*—Entrance requirements for international students are the same as those stated on pages 11–12, except that advanced standing is rarely granted for study in foreign law schools.

*For the Degrees of Master of Comparative Law and Master of Comparative Law (American Practice)*—The entrance requirements are the successful completion of and graduation from a course in arts, philosophy, letters, or sciences, equivalent to graduation from a gymnasium, lycée, or liceo; and graduation in law with high academic standing from a recognized foreign university. Admission to the American Practice program is limited to the fall semester each year.

*For the Degree of Master of Laws*—An international student will only be considered for admission to the Master of Laws program if he or she has a Juris Doctor or post-Juris Doctor degree with high academic standing from an American university.

*For the Degree of Doctor of Juridical Science*—The usual entrance requirements are the successful completion of and graduation from a course in arts, philosophy, letters, or sciences, equivalent to graduation from a gymnasium, lycée, or liceo; graduation in law from a recognized foreign university; outstanding capacity for scholarly work in the field of law; and a Master of Laws degree with high academic standing from an American university.

## DEGREE REQUIREMENTS

*Juris Doctor, Master of Laws, Masters of Comparative Law,* and *Doctor of Juridical Science*—Degree requirements for foreign students are the same as those stated on pages 14, 18, and 20.

*Master of Comparative Law*—The student must complete a residence period of at least two continuous semesters. All requirements for the degree must be completed in a period not exceeding three years from the time of registration for the degree. The student must complete satisfactorily 24 semester hours of approved courses in the Law Center, or in such other departments of the University as the faculty of the Center shall approve, and must maintain a cumulative average of at least 65 at all times. Transfer to the American Practice degree program is not permitted.

*Master of Comparative Law (American Practice)*—The general requirements are the same as those for the degree of Master of Comparative Law except that this degree requires 32 semester hours of course work. However, the courses approved will be limited to the required courses in the Juris Doctor curriculum (see pages 13–14) for those with a civil law background. For those with a common law background, a careful selection of required as well as core elective courses in the Juris Doctor program will be approved. A cumulative average of at least 65 must be maintained at all times. Transfer to the Master of Comparative Law degree program is not permitted.

## UNCLASSIFIED STUDENTS

Two types of students may be admitted to the National Law Center as unclassified students, in accordance with the following regulations:

1. A candidate for a Bachelor of Laws or Juris Doctor degree with an above average record at another law school that is a member of the Association of American Law Schools or is approved by the American Bar Association may, at the discretion of the Dean, be admitted as an unclassified student to earn credit for transfer to the other law school. Such students are normally admitted only to the summer sessions. They are admitted to the fall or spring semester only in unusual circumstances.

2. Graduates of law schools that are members of the Association of American Law Schools or are approved by the American Bar Association who wish to take advanced courses without pursuing degree programs may be admitted as unclassified students.

Unclassified students participate in the work of the course, take examinations and have their grades recorded. Credit for work earned as an unclassified student may not be applied to satisfy the requirements for a degree program unless express written approval is granted by the Dean at the time of admission.

## CONTINUING LEGAL EDUCATION

Members of the Bar who wish to keep abreast of current developments in the law may register for any of the courses in the National Law Center on a non-credit basis as Continuing Legal Education students. Such students do not take examinations in courses and no grades are recorded for their work.

A simplified admission and registration procedure is used and must be completed on or before the last day of regular registration for the appropriate semester. Continuing Legal Education students pay only the tuition fee on the semester-hour basis. They may not participate in student activities or benefit from the medical privileges of the University. (Continuing Legal Education registrations are subject to cancellation if courses are filled by regularly registered students.)



# GENERAL INFORMATION

The National Law Center has an enrollment of about 1,700 for the J.D. and Post-J.D degree programs. Approximately 1,000 students are enrolled in the full-time day division for the J.D. degree and 400 are enrolled in the part-time evening division. Three hundred students, many from abroad, are enrolled in the Post-J.D. degree programs.

## DAY AND EVENING CLASSES

Day classes meet in 50-minute periods, Monday through Friday. *Trial Practice Court* and certain other courses meet for two-hour periods on Saturday mornings.

Evening classes meet from 5:50 to 7:40 p.m., Monday through Friday. A four-credit course, e.g., *Evidence*, meets two evenings a week; a three-credit course, e.g. *Administrative Law*, meets two evenings a week for one-half the semester and one evening for the other half; a two-credit course, e.g., *Contracts II*, meets one evening a week. The evening division conforms to the standards of the day division, with the full-time faculty participating in the instruction.

Examinations for both day and evening classes may be given in the afternoon. Examinations for day students may be given in the evening.

## SUMMER TERM

A term of two sessions, with day and evening classes, is offered in the summer. Students may register for either or both sessions. *No beginning students are admitted to the Juris Doctor program in the summer term.*

The summer term is shorter than a semester of the academic year, and, as a consequence, a student must attend two and one-half summer terms to receive residence credit for one academic year or attend one and one-half summer terms to receive residence credit for a semester.

A maximum of 6 semester hours may be taken each summer session by day students. Day students receive four-tenths of a semester of residence credit for each session of the summer term in which they are registered for 3 or more semester hours. A maximum of 4 semester hours may be taken each session by evening students. Evening students receive three-tenths of a semester of residence credit for each session of the summer term in which they are registered for 2 or more semester hours.

## ADMISSION

Applicants are urged to submit application forms and complete credentials well in advance of the semester for which they seek admission. In the selection process there is no discrimination against any applicant because of sex, race, color, religion, handicap, or national origin. An application fee of $30 for a degree candidate ($15 for an unclassified student) must accompany the application.

Forms for application for admission or readmission are available at and should be returned to the Office of Admissions of the National Law Center, George Washington University, Washington, D.C. 20052.

For further details concerning students from foreign institutions, see pages 22–24.

## APPLICATION FOR ADMISSION

*Juris Doctor Program*—Beginning students are admitted only at the start of the fall semester.

The applicant should register with the Law School Data Assembly Service (LSDAS) by completing and mailing the registration forms supplied by the Law School Admission Services (LSAS). No application to this school will be processed unless accompanied by a Law School Application Matching Form, which is found in each applicant's LSAT/LSDAS registration packet. Since an LSAT and/or LSDAS report cannot be produced by LSAS without the Matching Form, it will be necessary to return to the applicant any application received without it. A transcript from each college or university attended should then be sent directly to LSAS, Box 2000, Newtown, Pennsylvania 18940. No transcript should be sent to the National Law Center. The LSDAS will analyze the transcript and send a copy to this law school and others that ordered a report. However, the applicant will be asked, upon acceptance, to submit directly to the National Law Center a final transcript showing evidence of the receipt of a bachelor's degree.

To provide time for the evaluation of credentials of beginning students, all papers, including the Law School Admission Test score, should be received by the National Law Center before March 1. This means that the October or December Law School Admission Test should be taken (see Entrance Requirements, pages 11–12).

All applications of transfer students should be received by the Admissions Office no later than June 1 for the fall semester, December 1 for the spring semester, May 1 for the first summer session, and June 1 for the second summer session.

For additional information, see the official *Pre-Law Handbook* prepared by the Law School Admission Council and the Association of American Law Schools. The Handbook includes material on the law and lawyers, pre-law preparation, applying to law schools, and the study of law, together with individualized information on most American law schools. It will be sent to all registrants by the Law School Admission Services.

*Master's Programs*—Students are admitted at the beginning of the fall or spring semester or any of the summer sessions. Application for admission, together with all required credentials, must be received by July 1 for the fall semester, November 1 for the spring semester, and one month prior to registration for the summer session for which application is made. Students are admitted in the fall semester only in the Master of Comparative Law (American Practice) program.

*Doctoral Program*—Students are admitted at the beginning of the fall or spring semester. Application for admission, together with the proposed dissertation topic and all required credentials, must be received by March 1 for the fall semester and October 1 for the spring semester.

*Unclassified Students*—Lawyers who wish to take graduate courses are admitted at the beginning of the fall semester, the spring semester, or any of the summer sessions. Students who wish to earn credit for transfer toward a Bachelor of Laws or Juris Doctor degree at another institution may be admitted to the summer sessions if they are in good standing at an accredited law school and have shown unusual ability in their law studies; they are admitted to the fall or spring semester only in unusual circumstances.

1. Application for admission, with required credentials, for a student who wishes to earn credit for transfer toward a Bachelor of Laws or Juris Doctor degree at another law school (see page 24), should be received at the Office of Admissions of the National Law Center at least one month prior to the first day of registration for the semester or summer session for which application is made.

2. Application for admission, with required credentials, for lawyers who wish to take graduate courses (see page 24), should be received at the Office of Admissions of the National Law Center by July 1 for the fall semester, November 1 for the spring semester, and one month prior to registration for the summer session for which application is made.

## READMISSION

A student who was previously registered but did not attend during the most recent semester (summer term excluded) should file an application for readmission. Closing dates for readmission are the same as those for admission (see Application for Admission, above).

If the student has attended one or more institutions of higher education during absence from the University or applies as a degree candidate and was previously a nondegree student, he or she must have complete, official transcripts sent to the Dean.

## REGISTRATION

Before attending classes each student must register in person. No student will be registered until proper credentials have been filed and approved (see Admission).

No registration is accepted for less than a semester or one summer session. A student may not register concurrently in George Washington University and another institution. Registration in more than one school of the University requires the written permission of the deans concerned, *prior to registration*.

Registration may be changed only with the permission of the Dean.

## ELIGIBILITY FOR REGISTRATION

A student who is suspended or whose record is not clear for any reason is not eligible to register.

*New Student*—Upon receipt of a *final letter* of admission a new student is eligible for registration on the stated days of registration.

*Readmitted Student*—A student previously registered who was not registered for courses during the preceding semester or summer session must apply for and receive a letter of readmission (see Readmission, above) before becoming eligible for registration.

## FEES AND FINANCIAL REGULATIONS

The following fees and financial regulations were adopted for the 1988 summer sessions and the 1988–89 academic year.

**Tuition Fees**

| | |
|---|---|
| J.D. candidates: | |
| Full-time program (11 or more hours*), each semester | $6,025.00 |
| Part-time program, each semester hour | 431.00 |
| Master's degree candidates (LL.M., M.Comp.L., and M.Comp.L. [Am. Prac.]) and Continuing Legal Education students, each semester hour | 327.00 |
| S.J.D. candidates,† full program, including the final examination | 11,075.00 |

**University Center Fee** (charged all students registered on campus)

| | |
|---|---|
| Each semester hour, to a maximum of $100.50 per semester | 9.50 |

**Computer Usage Fees** (charged for courses that use the computer facilities of the University)—Applicable fees are listed in the *Schedule of Classes* for each semester. The fee is $50 per course, but no student will be charged more than $100 per semester for computer use.

**Special Fees**

| | |
|---|---|
| Application fee (degree candidate), nonrefundable | 30.00 |
| Application fee (unclassified student), nonrefundable | 15.00 |
| Tuition deposit fee charged each student admitted to J.D. degree candidacy (payable in two installments—$100, nonrefundable, by a date specified in the letter of admission, $350, nonrefundable, by June 1) | 450.00 |
| Fee for binding Master's theses and S.J.D. dissertations | 15.00 |
| Late-registration fee, for failure to register within the designated period: | |
| During first week of classes | 25.00 |
| During second and third weeks of classes | 50.00 |
| After third week of classes (if permitted) | 100.00 |
| Late-payment fee, charged for failure to make payments when due (see Payment of Fees, below) | 15.00 |
| Replacement of lost or stolen picture identification card | 2.00 |
| Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below) | 35.00 |
| Returned check fee, charged a student whose check is returned because of insufficient funds or for any other reason | 15.00 |
| Transcript fee | 2.00 |

Registration on campus in the University entitles each student to the following privileges: the services of the Career Services Center; the use of the University library; gymnasium privileges; admission to all athletic contests, unless otherwise specified; the *Hatchet*, the student newspaper; and medical attention as described under Student Health Service. These privileges terminate and a student is no longer in residence upon withdrawal or dismissal from the University.

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*With the prior permission of the Dean, a J.D. degree candidate may take more than 14 semester hours after the first year of study.

†The tuition fee is to be paid at the rate of $2,768.75 per semester for four successive semesters, exclusive of the summer term or terms. If the Faculty should approve an extension of time, the student must maintain enrollment.

## PAYMENT OF FEES

No student is permitted to complete registration or attend classes until all charges are paid or until arrangements for payment have been made. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made out to George Washington University with student identification number shown in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. Students registered for 6 semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration, permitting them to pay one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the ninth week of classes for the fall and spring semesters. Interest at the rate of 8 percent per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $1,500 or more. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of 8 percent per annum. Accounts that become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

*Returned Check Policy*—A student whose check is returned unpaid by the bank for any reason will be charged a returned check fee. If the check is not paid within 15 days, the student's account will be financially encumbered, with the same restrictions and penalties as for late payment enumerated above.

## PREPAID AND DEFERRED PAYMENT PLANS

Several commerical programs are available for those who wish to pay the costs of their education on a monthly basis. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

Mellon Bank Edu-Check Plan, P.O. Box 8888, Wilmington, Del. 19899

Richard C. Knight Insured Tuition Plan, 53 Beacon Street, Boston, Mass. 02108

School-Chex, Irving Trust Company, 61 Broadway, New York, N.Y. 10007

Educational Loan Program, The Riggs National Bank, 1913 Massachusetts Ave., N.W., Washington, D.C. 20035

The Tuition Plan, Inc., Concord, N.H. 03301

Tuition Line, Maryland National Bank, Consumer Banking Division, P.O. Box 1954, Baltimore, Md. 21203

## WITHDRAWALS AND REFUNDS*

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the Dean. Withdrawal from courses is permitted after the midpoint of a semester only in extraordinary circumstances. Notification to an instructor is not an acceptable notice.

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal* from the University:
   Withdrawal on or before Friday of the first week of classes . . . . . .90%
   Withdrawal on or before Friday of the third week of classes . . . . . .75%
   Withdrawal on or before Friday of the fifth week of classes . . . . . .50%
   Withdrawal after the fifth week of classes . . . . . .None
2. *Partial withdrawal*: If the change in program results in a lower charge, the refund schedule above applies to the difference.
3. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

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Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be refunded or reduced because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

# FINANCIAL AID

The National Law Center has been able in recent years to assist many students in obtaining the financial aid they require, through full or partial scholarships, various loan programs, part-time employment, or a combination of these kinds of assistance.

## GRADUATE AND PROFESSIONAL SCHOOL FINANCIAL AID SERVICE

The National Law Center participates in the Graduate and Professional School Financial Aid Service (GAPSFAS), which provides an analysis of an applicant's financial need. Entering students wishing to receive financial aid should request the materials from GAPSFAS, Educational Testing Service, CN–6660, Princeton, New Jersey 08541-6660. The information provided by the applicant and the applicant's parents will be analyzed and a copy of the report will be sent to the Law Center. In addition, students entering the National Law Center in the day program who desire

* The $450 deposit required of entering students is nonrefundable. Regulations covering withdrawal and refunds for the summer sessions are stated in the *Summer Sessions Announcement*.

to be considered for a scholarship must submit a letter to the Law Center by March
outlining their academic qualifications, their extracurricular activities, and the
reasons for believing a scholarship award to them is justified.

Students needing financial assistance should file with GAPSFAS in time for their
reports to be received at the Law Center as early as possible, since the Committee
on Student Financial Aid of the Law Center will begin making awards in March, and
available funds are limited.

*No awards will be made to an entering student until the admission process has been completed.*

## JURIS DOCTOR PROGRAM

### Scholarships, Fellowships, and Research Assistantships

Application and correspondence concerning scholarships, fellowships, and re
search assistantships should be sent directly to the Dean. Unless otherwise spe
cified, application and supporting credentials should be submitted no later than
March 1 preceding the period for which the award is made.

*Arent, Fox, Kintner, Plotkin & Kahn Scholarship (1973)*—Scholarship aid for
needy law students from the Washington, D.C., area.

*Mildred Gott Bryan Scholarship Fund (1965)*—Partial scholarship aid for stu
dents in the National Law Center.

*Jacob Burns Merit Scholarship Fund (1987)*—Income from the Fund is used
annually to award grants toward tuition for Juris Doctor candidates who shall be
selected, without regard to financial need, on the basis of their proven academic
abilities, their aptitude for law study, and their qualities for leadership. Those
selected shall be designated as Jacob Burns Scholars of the National Law Center of
The George Washington University.

*Charles Worthington Dorsey Memorial Scholarship (1947)*—Memorial to
Charles Worthington Dorsey, LL.B. 1881, LL.M. 1882. A full-tuition scholarship for
the course leading to the degree of Juris Doctor, awarded to a needy and promising
graduate of this University with a Bachelor of Arts or equivalent degree. Ordinarily
this scholarship is awarded once every three years.

*Patricia Roberts Harris Scholarship Fund*—This fund was created from a bequest
by the late Patricia Roberts Harris, J.D. 1960. Mrs. Harris was Secretary of Housing
and Urban Development and Secretary of Health, Education and Welfare. She also
served as a member of the faculty of the National Law Center. The income from this
fund will be awarded to an entering first-year law student who reflects the values of
academic excellence and social justice exemplified by the life and career of Pro
fessor Harris.

*Honor Scholarships*—Two scholarships available each year to students entering
upon full-time study. Each scholarship provides a cash award, in addition to tuition
aid, in an amount depending on need, for all three years. These scholarships are
awarded on the basis of outstanding college records, both academic and extracur
ricular; Law School Admission Test scores; and need. To retain the scholarship for
the second and third years, the candidates must maintain a *B* average, both for each
year and cumulative.

*Hourey and Simon Scholarship (1982)*—An annual award to provide tuition
assistance to worthy students.

*Hunton and Williams Scholarship (1981)*—An annual award of $1,000 given by
the law firm of Hunton and Williams in recognition of the quality of the legal
education offered at this law school.

*Law Center Tuition Remission*—For Juris Doctor students, based on financial need

*Jacob and Charlotte Lehrman Foundation Scholarship Fund (1987)*—For an ongoing partial scholarship to a third-year law student director in the clinical program.

*Robert Netherland Miller Scholarship Fund (1985)*—Established by the Washington, D.C., law firm of Miller and Chevalier. The income from this fund will be used for scholarship purposes.

*Phi Delta Delta Scholarships (1959)*—Zeta Chapter of Phi Delta Delta Legal Fraternity (International) provides tuition aid to a student in the second year of the Juris Doctor program who excelled in scholastic achievement and service to the Law Center in the first year.

*Vernon Romney Scholarship Fund (1977)*—To provide a scholarship to some worthy student in the Law Center.

*Donald C. Snyder Scholarship Fund (1987)*

*Trustee Scholarships*—Scholarships awarded each year to entering full-time students, for tuition aid, in amounts depending on need. Candidates must have demonstrated qualities of leadership, in addition to scholastic attainment. To retain the scholarship, the successful candidate must maintain a *B* average, both for each year and cumulative. Application must be made to the Dean before March 1.

Tuition-aid scholarships are also available to continuing second- and third-year full-time students with demonstrated scholastic ability, on the basis of financial need and capacity for leadership. Application should be made to the Dean prior to June 1.

*Frank S. Whitcomb Scholarship Fund (1971)*—For aiding and assisting worthy young men and women in securing a legal education.

*Glen A. Wilkinson Scholarship Fund (1986)*—Created by a generous gift of Katherine Wilkinson in memory of her husband, Glen A. Wilkinson, J.D. 1938, a distinguished alumnus who served as Chairman of the Board of Trustees of the University. The income from the fund will be awarded to a J.D. student on the basis of academic excellence, good character, honorable conduct, and financial need.



*J. McDonald and Judith K. Williams Scholarship Fund (1987)*—For talented and promising law students who may need financial assistance to attend the University.

## Loan Funds

Through the generosity of friends of the University, a number of loan funds are available. Among them are the Lyle T. Alverson Loan Fund; the Robert Ash Loan Fund; the George R. Beneman Loan Fund; the Morris and Gwendolyn Cafritz Foundation Minority Law Student Loan Fund; the Robert M. and Mary McConnel Cooper Loan Fund; the

Robert McKinney Cooper Memorial Loan Fund; the Mitchell S. Cutler Memorial Loan Fund; the J. Forrester Davison Loan Fund; the Clifford A. Dougherty Fund; the District of Columbia Bar Association Loan Fund; the J.W. Ehrlich Foundation Loan Fund; the Newell W. Ellison Loan Fund; the Louise F. Freeman Memorial Student Loan Fund; the Harold L. and Violet George Foundation Loan Fund; the George Washington Law Association Loan Fund; the Morris Golub Loan Fund; the Frederick O. Graves Law Student Loan Fund; the John B., Jr., and Carol H. Holden Loan Fund; the Jephson Educational Trust Loan Fund; the Susan and Anne Kondrup Memorial Fund; the Law Association Loan Fund for the law classes of 1912, 1918, 1921, 1924, 1929, 1931, 1933, 1935, 1936, 1937, 1938, 1939, 1941, 1942, 1945, 1950, 1951, 1952, 1953, 1955, 1959, 1960, 1961, 1962, 1963, 1964, 1965; the Law School Loan Fund; the Oscar Lawler Memorial Loan Fund; the Horace L. Lohnes Memorial Assistance Fund; the Jessie B. Martin Loan Fund; the Robert N. Miller Loan Fund; the Joan Murphy Loan Fund; the Mike Pelekiri Loan Fund; the Phi Delta Delta Loan Fund; the W. Theodore Pierson Loan Fund; the Rockport Loan Fund; the Samuel L. Samuel Loan Fund; the H. William Tanaka Law Students Assistance Loan Fund; the Orville Hasso Walburn Memorial Loan Fund; the Ralph E. West Memorial Loan Fund; the Wm. Williams Memorial Student Loan Fund; the Patricia A. Willoner Loan Fund; the Ruth F. Wilson Loan Fund; the Yadao and Kanemoto Loan Fund; and the Samuel Greene Memorial Loan Fund.

In addition, financial assistance is available through the Guaranteed Student Loan Program, Perkins Loans, work–study, and other sources.

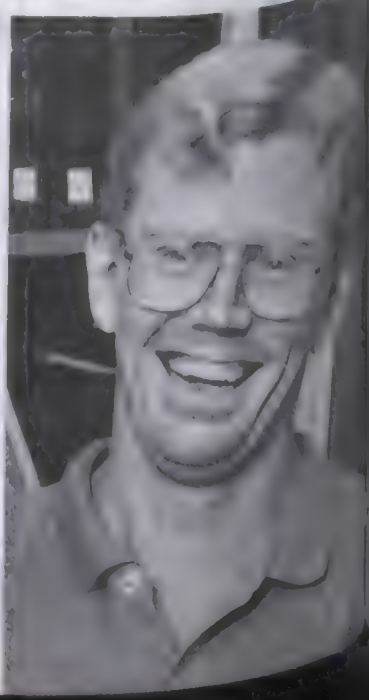
Application for financial assistance should be made in the Office of the Dean.

## MASTER'S AND DOCTORAL PROGRAMS

### Fellowships and Scholarships

Application should be made before March 1 preceding the period for which the award is made. The applicant should submit an application for admission as a





degree candidate and a personal letter applying for a fellowship to the Dean. The letter of application should contain complete biographical data, information concerning experience in practice or teaching, copies of or citations to published legal writings, and such other information the student believes will be of assistance in the consideration of the application. Applicants should arrange for letters of recommendation to be sent from two members of their law faculty directly to the Dean. The applicant's academic rank in class should be included either in the transcript of the law school or in the letters of recommendation.

*Marcus B. Finnegan Memorial Fellowship*—Established in memory of Marcus B. Finnegan, LL.M. '57, who, as an alumnus, lawyer, and teacher, brought distinction to the field of patent law. The Fellowship was established in 1979 with generous gifts by Mr. Finnegan's law firm, Finnegan, Henderson, Farabow, Garrett & Dunner, his clients, and his many friends. The Graduate Fellowship in Intellectual Property is awarded with a requirement that the recipient prepare a publishable paper in the field of international intellectual property.

*Richard Paul Momsen Scholarships for Brazilian Graduate Law Students*—Bequest of Richard Paul Momsen, LL.B. 1912. Awarded 1984–85 and alternate years, for the study of U.S. constitutional law and the law of patents and trademarks.

*Randolph C. Shaw Graduate Fellowships in Administrative Law*—Bequest of Randolph C. Shaw, LL.B. 1915, LL.M. 1923. For graduate study in administrative law with particular emphasis on protection of the interests of ordinary citizens involved in contacts with administrative agencies.

*University Teaching Fellows*—The National Law Center annually appoints three to five University Teaching Fellows who are responsible for conducting the first-year courses *Legal Research and Writing* (Law 220) and *Moot Court* (Law 221). Teaching Fellows are appointed to a term of two academic years, during which they pursue graduate study leading to the LL.M. The 1988–90 Fellows receive $13,000 plus full tuition for the first academic year and $14,000 plus full tuition for the second academic year. The deadline for application for appointment as a Teaching Fellow is April 15.

## PRIZES

*Bureau of National Affairs Law Student Prize*—Presented to an outstanding senior law student.

*Jacob Burns Prize*—Established by Jacob Burns, a law alumnus and Honorary Trustee of the University. A medal and a cash award presented annually to each of the two members of the winning team in the upper-class Van Vleck Moot Court competition.

*The Michael D. Cooley Memorial Prize*—A plaque given to that individual in each graduating class who has been most successful in maintaining his or her compassion, vitality, and humanity during law school. The recipient of this award is selected by the graduating class during the spring of the third year at the National Law Center.

*Ogden W. Fields Graduate Prize*—Awarded annually to the graduate student who has demonstrated the highest overall proficiency in a course in labor law.

*Charles Glover Prize*—Established by Charles Carroll Glover, Jr., an Honorary Trustee of the University, in memory of his great-grandfather, an illustrious member of the bar of the District of Columbia. A cash award given annually to the student who has attained the highest average grade in the third-year, full-time course.

*Kappa Beta Pi Prize*—Awarded by Eta Alumnae Chapter to the law student who attains the highest average for the first year.

*John Bell Larner Prize*—By bequest, a medal awarded annually to the meri of the graduating class who attains the highest average grade in the entire course the degree of Juris Doctor.

*John Ordronaux Prizes*—By bequest, awarded annually to the student who ha attained the highest average grade in the first-year, full-time course and to t student who has attained the highest cumulative average grade at the end of second-year, full-time course.

*Jennie Hassler Walburn Prize*—A cash award to the outstanding student in t field of civil procedure, established by the will of the late Professor Orville Hassl Walburn in memory of his mother.

*Imogen Williford Constitutional Law Prize*—Established by Imogen Willifor J.D. 1929. A cash award presented to the outstanding student in the field o constitutional law.

## REGULATIONS

### ACADEMIC WORK LOAD

*Juris Doctor Candidates*—Juris Doctor candidates without substantial outsid employment may take a program of studies of 14 hours a week. Such students ma take courses in the evening only if they are not scheduled in the daytime and a majority of the hours taken are in day courses. The Dean is authorized to approv programs of study of more than 14 hours in exceptional cases; however, no progra will be approved that would permit the student to complete requirements for th degree in less than 28 months after beginning the first year of law study. Student with more than 20 hours of outside employment, whether in the day or evening division, must take a limited program of studies not exceeding 10 hours a week Students taking a majority of their classes in the evening may not take more than hours a week; the minimum load is 8 hours, except in special cases when 6 hours may be approved by the Dean for a limited time. A minimum schedule for 11 hours in the day division is required except in unusual circumstances when a reduced program is authorized by the Dean.

Students taking more than 8 hours in the day division or 4 hours in the evening division must have the permission of the Dean to take a Bar Review course

Students may transfer from the day division to the evening division only with permission of the Dean.

With the approval of the Dean, second- and third-year students may take a maximum of 6 semester hours of appropriate graduate-level courses in other departments of the University; such a student must receive a grade of at least B to obtain credit for such courses, and in no event will the grade count in computing the cumulative average.

*Master's Candidates*—Master's candidates without substantial outside employment may take a maximum of 12 hours a week. Students with more than 20 hours outside employment must take a limited program of study not to exceed 8 hours week. The minimum load is 4 hours unless approval for fewer hours is given by the Dean for a limited time.

### ATTENDANCE

Regular attendance at classes is required and is necessary for successful work. A student who is deficient in class attendance in any course may be barred from taking the examination.

## CHANGES IN PROGRAM OF STUDIES

A student may not add courses or change from one section to another of the same course without the approval of the Dean. Students may drop courses only with the written approval of the Dean. In addition, approval of the instructor is ordinarily required unless the request is made early in the semester. Under no circumstances may a student drop a course after the last day of classes in any semester or summer session.

## RESEARCH PAPERS

The preparation of a research paper is required in lieu of an examination in seminars and in other courses, as indicated in the course descriptions. To receive a numerical grade on a research paper, the paper must be submitted by the last day of classes in the semester or, with the permission of the instructor, by the last day of the examination period (the last day of any examination given in any course). For sufficient reason, the instructor may extend the deadline (but not later than the last day of the examination period of the following semester, or without express permission of the Dean, not later than the normal graduation date for the student), subject to the following conditions: (1) no student will receive any credit for the course for any purpose until a paper acceptable to the instructor has been submitted, (2) the only grade the student may receive for the course is *CR* (Credit) or *NC* (No Credit). To receive credit, a minimum grade of 65 is required for J.D. candidates and 75 for LL.M. candidates. Failure ultimately to submit any paper for the course will result in a grade of 45. Students who are candidates for the J.D. degree may register for one course requiring a research paper in each semester; with the approval of the Dean such students may register for more than one such course each semester.



The following guidelines have been approved by the faculty and are intended to apply to Law 314, *Legal Writing*, and to research paper courses that satisfy the writing requirement. The faculty recommends that the paper's topic and length should receive specific approval by the faculty member. Furthermore, an outline should be submitted, to be followed by a draft. (The purpose of a draft, submitted during the course of the semester, is to allow the student the opportunity to improve the paper. A faculty member has the discretion to require a revised draft or to permit one if so requested by the student. A revised draft is necessary only if the professor requires it.) Approval of the topic, outline, and draft should be by a specified date. The paper should follow the Blue Book style.

## EXAMINATIONS

Written examinations are held at the end of most courses. Every student is required to take the regular examinations unless excused. No excuse for absence will be granted except by the Dean and then only for illness or other emergency. Application for excuse must be made in writing not later than one month after the date of the examination. A student excused from a final examination will be permitted to apply to the instructor for a Credit/No Credit determination. The instructor will select the mode of determination (for example, a makeup examination or paper). The student will have the option of (1) complying (prior to the completion of the semester following the excused absence) with the instructor's procedure of determining Credit/No Credit (minimum grade of 65 required for J.D. candidates and ~ for LL.M. candidates) or (2) having the grade *I* (Incomplete) entered on the record and taking the next regularly scheduled examination for a numerical grade. The examination may not be taken after exclusion for low scholarship.

Permission to take an examination before the regularly scheduled date will not be granted. Permission to take a postponed examination is limited to the situations provided for in the preceding paragraph.

A student who has been excused from taking a regular examination and who is a candidate for a degree to be conferred prior to the next regular examination in the subject may petition the Scholarship Committee, which may authorize such action as the circumstances require.

If a student fails to take an examination, a grade of 45 will be recorded unless the student has been excused from the examination as provided above or has obtained the Dean's permission to drop the course.

## CREDIT/NO CREDIT OPTION

Candidates for the degree of Juris Doctor may take, in addition to courses regularly given on a Credit/No Credit basis, 6 semester hours of elective course work on a Credit/No Credit basis; a grade of Credit will be recorded if the course is satisfactorily completed with a grade of 65 or better. The Credit/No Credit option may be elected for only one course during a semester or summer session. The final date for an election of Credit/No Credit in an elective graded course will be the Friday of the third week of a semester, the Friday of the third week of a six-week summer session, or the Friday of the third week of a 13-week summer session. An unexcused failure to take an examination in a course or failure to submit a required research paper will result in the recording of a grade of 45 for a course taken on a Credit/No Credit basis.

No student may take more than 17 semester hours of courses (including Law 220 and other courses regularly given on a Credit/No Credit basis) on a Credit/No Credit basis.

Students are advised to consider carefully the advisability of electing to take courses on a Credit/No Credit basis. In the opinion of the faculty, a student's election to take courses on a Credit/No Credit basis may, in view of the importance apparently attached to grades by educational institutions and employers, be detrimental to the student's career in the legal profession.

## GRADES

Grades are given in numerical terms equivalent to letter grades as follows: 85–100, *A*, Excellent; 75–84, *B*, Good; 65–74, *C*, Satisfactory; 55–64, *D*, Poor—below standard for graduation; 45–54, *F*, Failure. In Law courses 220, 321–22, 323, 342, 343, 345, 346, 385, 399, 459, 479, 509, 579, 593, and 620 grades are *CR*, Credit (minimum grade of 65 required for J.D. candidates, 75 for LL.M. candidates); *NC*, No Credit. In Law 220, the grade of *H* (Honors) may be earned for work of excellent quality. A student who has been excused from taking a regularly scheduled examination is given the grade of *I*, Incomplete. See Examinations (above) for grade upon failure to take an examination. Grades between 55 and 100 indicate that the work has been completed and credit given. Grades between 55 and 64, however, do not represent satisfactory work and adversely affect a student's cumulative average. No credit is given to J.D. and M.Comp.L. candidates for grades below 55 or to LL.M. candidates for grades below 65. No grade may be changed by an instructor after it has been posted in the Law Center or disclosed to a student unless there has been an error in arithmetic certified in writing as such by the instructor.

Any student who receives a grade below 55 (*F*) has the right to retake the course once, from the same or a different instructor, but only within the next academic year. (This does not apply to post-J.D. students.) The grade received in the retaken course is entered into the student's record in addition to the original grade and both grades are included in computing the student's average. A student may exercise the right to retake a course only with respect to two different courses during study at the Law Center.

The cumulative average of a student includes all grades in all courses taken while a candidate for a particular degree.

## EXCLUSION AND PROBATION FOR POOR SCHOLARSHIP

*Candidates for the Degree of Juris Doctor*—A student whose cumulative average at the end of any semester falls below 65.0 but is above 64.0 will be put on probation. If such a student fails to raise the cumulative average to 65.0 at the end of the next semester, the student will not be permitted to register for any succeeding semester unless he or she petitions for and receives the permission of the Scholarship Committee.

A student whose cumulative average at the end of any semester falls below 64.0 will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the Scholarship Committee to register.

A student who fails or receives a grade of No Credit in more than one course over the entire period of law study will not be permitted to register for any succeeding semester or to graduate unless the student petitions for and receives the permission of the Scholarship Committee.

A student who is not permitted to register under the foregoing provisions will be excluded as of the beginning of the semester for which he or she was ineligible to register.

Students who are registered at the time they receive notice that they will not be permitted to register for the next semester are entitled to withdraw from school

and to receive a full refund of the tuition paid for the semester or to complete no work for which they are registered.

Any student excluded may petition for reinstatement; if the student can demonstrate that the low grades were due to circumstances beyond his or her control and that he or she has the capacity to pursue the study of law with a definite likelihood of success, that student may be readmitted subject to such conditions as may be imposed by the Scholarship Committee.

Despite the above provisions, a student will be allowed to complete the first two semesters of law study before being denied permission to register for a succeeding semester.

For this purpose the term "semester" includes a session of the summer term.

*Candidates for Master's and Doctoral Degrees*—A candidate for a Master's or doctoral degree whose work is not satisfactory in the opinion of the faculty, taking into consideration the requirements and standards for the degree, may, by action of the faculty, be excluded at the end of the semester for which the candidate is currently registered.

A cumulative average of 78 is required for the Master of Laws degree and a cumulative average of 65 for the Master of Comparative Law degrees. A student whose cumulative average falls below the required minimum at any time will be ineligible for continuation in the program without the permission of the Dean. Such a student will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the Dean or the Board for Graduate Studies.

*Unclassified Students*—An unclassified student whose work is not satisfactory may be excluded at the end of the semester for which the student is currently registered.

## SUMMER SCHOOL CREDIT

Students planning to attend summer sessions at other law schools and desiring to use the credit toward their Juris Doctor program at the Law Center must first have the courses they wish to take approved by the Dean. Students may not take courses in summer sessions at other law schools in this vicinity if the same courses are being given during the summer sessions at the National Law Center. In no event will credit be given for unsatisfactory work or be recognized in excess of that which might be obtained in a similar period in this program. Students who register at another law school must provide the Dean with an official transcript of their work there promptly on its completion.

## TRANSCRIPTS OF RECORD

Official transcripts of student records will be issued on request of the student or former student who has a clear financial record. A fee of $2 is charged for each transcript.

## CONTINUOUS ENROLLMENT

Degree candidates are expected to maintain continuous enrollment until *all* degree requirements are satisfied. By failing to register for one semester or more, the student breaks registration and must be readmitted (see Readmission, page 28). A readmitted student is required to satisfy the curriculum requirements existing at the time of readmission.

## GRADUATION REQUIREMENTS

Diplomas are awarded in February, May, and September.

To be recommended by the Faculty for graduation, a student must have met the admission requirements of the National Law Center; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which the student is registered; and be free from all indebtedness to the University. Registration is required for the semester or summer session at the close of which the degree is to be conferred.

*Application for Graduation*—An Application for Graduation must be filed by the dates indicated in the Calendar (pages 5–6) during the last semester or summer session of the final year. Students completing degree requirements during the summer sessions will be awarded diplomas (no formal convocation) September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the summer sessions. If they wish, such students may participate in the Winter Convocation.

## ACADEMIC DISHONESTY

The University community, to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper University channels.



Copies of the University policy on academic dishonesty can be obtained from the following offices: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

## UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions that are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive the student's written consent before releasing information from his or her education records to persons outside the University, except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment, field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar at the beginning of each semester or session of enrollment.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

## RIGHT TO CHANGE RULES

The University and its college, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

## RIGHT TO DISMISS STUDENTS

If a student knowingly makes a false statement or conceals material information on an application for admission, registration form, or any other University document, the student's registration may be canceled and the student will be ineligible (except by special action of the Faculty) for subsequent registration.

The right is reserved by the University to dismiss or exclude any student from the University or from any class or classes whenever, in the interest of the student or the University, the University Administration deems it advisable.

## RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

### PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A Lost and Found Office is maintained on campus in the Safety and Security Office.

### STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities*, which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University, which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

### UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of the law, including violation of those laws that proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.

## STUDENT SERVICES

### RESIDENCE HALLS

The University does not provide regular residence hall space for graduate students. However, the Housing and Residence Life Office refers graduate students to apartments as they become available in University-owned buildings in the campus area. Additionally, the Housing and Residence Life Office operates an Off-Campus Housing Resource Center, and attempts to provide information and assistance for those seeking accommodations. For complete information on this service, as well as apartment guides and referrals, interested applicants should contact the Director of Housing and Residence Life, George Washington University, Washington, D.C. 20052.

### FOOD SERVICE

Contract food service is available from August to May, based on the undergraduate academic calendar of registration, exams, and vacation periods. Accommodations for the law school calendar are made. Rates for the various meal plans are available from the Housing and Residence Life Office. Contract service is cafeteria style and provided in two residence halls and the Cloyd Heck Marvin Center. Meal coupons may also be used on a cash-equivalency basis in the Marvin Center first floor cafeteria and in George's on the fifth floor.

## CLOYD HECK MARVIN CENTER

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board, the departments offering course work in the performing arts, and other student and faculty organizations. The Center Governing Board, representing varied segments of the University community, plays an important role in the day-to-day functioning of the Center. The Board works closely with the full-time staff in the development of procedures and policies that provide a framework for the Center's operation.

## STUDENT HEALTH SERVICE

The Student Health Service is an outpatient clinic located at 908 New Hampshire Ave., N.W. The Service is scheduled to move to the new Burns building extension in October 1988.

The Health Service is staffed by physicians, nurse practitioners, and physician assistants who are capable of addressing most of students' medical problems. Visits are cost-free and may be either arranged by appointment or, during certain hours, secured on a walk-in basis. Most routine laboratory tests may be performed in the Health Service lab at cost, many common medications are stocked to fill student prescriptions, and allergy shots and immunizations are administered by the staff nurse for a minimal charge. A psychiatrist works in the Health Service to assist students with mental health concerns.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in off-campus programs and the Continuing Engineering Education Program are not eligible. Students who so desire may engage physicians and nurses of their own choice, but these students will be responsible for all fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and referrals to specialists or other outside physicians) are the responsibility of the student.

### Health and Accident Insurance

The University has arranged for and endorsed group health and accident insurance, on an elective basis, for those students who do not have other coverage. Interested students should contact the Student Health Service or Office of the Dean of Students.

## STUDENT EMPLOYMENT

A student taking more than 10 semester hours must limit outside employment to not more than 20 hours (see Academic Work Load, page 36). It is urged that all full-time students refrain from engaging in outside employment during their first year. Although work in some special areas may contribute to the learning and experience of the student, as a general rule it will compete with time needed for adequate study and preparation, which are at the heart of a good legal education.

## CAREER DEVELOPMENT AND PLACEMENT SERVICES

The Career Development Office provides a full range of services to support the career decision-making process. Students, graduates, and prospective employers are served through a variety of programs, including systems of job-vacancy advertising, newsletters of current career information; individual and group counseling on resume preparation, interviewing skills development, and job-search strategy; a career resource library; and forums and panel presentations covering legal career topics as well as employment options.

A strong campus interviewing program is organized in the fall of each academic year to enable prospective employers to interview second-year students for summer positions and third- and fourth-year students and LL.M. candidates for permanent positions. In 1987, the 395 participating employers represented 39 states and included private law firms, legal services offices, corporations, government agencies, accounting firms, and District Attorney's offices.

During the fall of 1987, the Career Development Office conducted regional off-campus interviewing programs in New York City, Boston, Philadelphia, Chicago, San Francisco, Los Angeles, Miami, and Dallas (the latter two programs were offered in cooperation with the Georgetown University Law Center). These programs supplemented the campus interviewing process by providing students exposure to 87 firms and organizations that did not interview on the George Washington University campus.

In addition to the structured interviewing programs offered during the fall, the Career Development Office organizes other options for employer/student contact. Approximately 116 employers who were unable to interview on the George Washington University campus requested that the Career Development Office collect resumes for their review and follow-up. Other employers requested that students contact them directly. Through this process, 250 summer positions and 250 positions for 1988 graduates were listed.

The National Law Center is a member of the Consortium of Washington, D.C., Area Law Schools, which sponsors the Public Service/Public Interest Interviewing Day early in the spring semester. During the past year, 38 organizations representing government agencies, public interest organizations, and legal services offices interviewed students for specific job openings. The Consortium also sponsors a cooperative interviewing program targeting major corporations. Past participants represented such industries as banking, oil and gas, steel, foods and beverages, data processing, accounting, and insurance.

The Career Development Office held its first Washington metropolitan area, small-firm interviewing program in the spring of 1988. The purpose of this regionally targeted program is to increase the number and variety of legal opportunities for 50–60% of the graduating class wishing to locate employment within the metropolitan area. This year's response from employers was so vigorous that the program grew from one to two full days of interviewing. A total of 60 firms participated over both days. Invitations were mailed to all law firms with 30 or fewer attorneys in the D.C. metropolitan area.

The Career Development Office publishes a newsletter, *Noteworthy*, distributed biweekly to all students to keep them informed of upcoming programs, application deadlines, general career news, trends in hiring, bar examination rule changes, and other pertinent information. The Office also distributes to alumni the *Graduate Career Opportunities Newsletter*, which advertises current job openings of local and national interest that are concurrently advertised in the Career Development Resource Library.

Each year in February, the Career Development Office conducts a survey of the previous year's graduates. Responses from 325 members of the 198[illegible] graduating class showed 63% in private practice, 15% in government (including the military), 8% in judicial clerkships, 6% in business and industry, 1% in legal services or public interest, and 7% in other positions. The highest concentration of graduates (53%) is in the Middle Atlantic region, which includes Delaware, the District of Columbia, Maryland, Virginia, and West Virginia. New York, New Jersey, and Pennsylvania are home to 16%, and 5% are located in the New England states. The Pacific Coast states (and Hawaii) drew 9%, and the East North Central states attracted 4%. Small percentages went to a number of other states and foreign countries.

## VETERANS BENEFITS

The veterans counselor, located on the third floor of Rice Hall, 2121 I Street, N.W., assists students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems that may arise concerning their benefits. This office also processes certification of enrollment and attendance to the Veterans Administration so that monthly allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting an application to the Veterans Administration. All such students should obtain the instruction sheet issued by the Office of the Registrar, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and which includes other information of general interest. The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

## DISABLED STUDENT SERVICES

The Director of Disabled Student Services coordinates advising, orientation, and special services that address the needs of disabled students. The Director also serves as a central point of contact from which the University community may obtain information and assistance in serving disabled students. A resource library maintained in the office is available for general use.

In addition to coordinating a program of general assistance to promote integration of disabled students as fully as possible into the life of the University community, the Director administers reading and sign language services for those with visual and auditory handicaps.

The office is located on the fourth floor of Rice Hall, 2121 I Street, N.W.



# COURSES OF INSTRUCTION

## CAREER PLANNING AND COURSE SELECTION

One of the great strengths of the National Law Center is the diversity of its course offerings and the flexibility it offers students to design their programs to fit their interests and career plans. Every spring a series of counseling sessions is held to provide students with an overview of course offerings in various areas of the law and to assist them in selecting courses and defining their career objectives. Students also may consult members of the faculty for course and career planning. In addition, the Career Development Office provides a central storehouse of information regarding many types of legal careers.

While the curriculum after the first year is largely elective, the faculty believes that exposure to certain course work is important. Consequently, the faculty strongly recommends that all students take Administrative Law (342), Corporations (327), Taxation—Federal Income (420), and Trusts and Estates I (390).

In addition, the faculty believes that a generalist J.D. program would normally include most of the following courses and recommends that students take most of them prior to graduation: Conflict of Laws (440), Federal Antitrust Law (452), Labor Law (338), Remedies (380), and one or more of the following: Commercial Paper, Check Collection, and Banking (372), Creditors' and Debtors' Rights (378), and Sales and Sales Financing (370).

The Law Center's broad offering of elective courses is listed below. Courses numbered 500 and above are generally more advanced but are open to second- and third-year students who have taken the prerequisite courses. Both second- and third-year students may take more than one such course with the permission of the Dean.

Among the courses offering clinical work are: Law 414, 460, 483, 492, 493, 495, 496, 497, 498, and 596.

The courses of instruction listed below are subject to change. The University reserves the right to withdraw any course announced.

### ELECTIVE COURSES AND SEMINARS (300–499)

Administration of Government Contracts (489)
Administrative Law (342)
Admiralty (386)
Agency and Partnerships (322)
American Legal History (Seminar) (318)
Banking Law I (332)
Banking Law II (333)
Business Planning (334)
Clinical Law Work (492)
Clinical Studies in Environmental Law (414)
Clinical Studies in Urban Law (497)
Collective Bargaining and Labor Arbitration (340)
Commercial Paper, Check Collection, and Banking (372)
Community Property/Marital Property (394)
Comparative Law (438)
Computers and the Law (468)
Conflict of Laws (440)
Constitutional Law (Seminar) (350)
Corporations (325)
Creditors' and Debtors' Rights (378)
Current Decisions (364)
Current Problems in Land Use Management Controls (Seminar) (403)
Disabled People and the Law (482)
Domestic Relations (434)

Drugs and the Law (Seminar) (474)
Environmental Law I (410)
Environmental Law II (411)
Estate Planning (Seminar) (395)
Federal Antitrust Laws (452)
Federal Jurisdiction (300)
Government Contracts (Seminar) (490)
Government Contracts (486)
Government Contracts Cost and Pricing (491)
Government Procurement Law (487)
Immigration Law (360)
Insurance (382)
International Business Transactions, Legal Aspects of (446)
International Law and World Order (444)
Introduction to International Economic Law (445)
Journal of International Law (366)
Jurisprudence (442)
Labor Law (338)
Land Development Law (408)
Land Use Administrative Process (404)
Law and Accounting (324)
Law and Criminology I (478)
Law and Criminology II (479)
Law and Medicine (472)
Law and Psychiatry (Seminar) (437)
Law and the Deaf Clinical Education Activities (483)
Law, Science, and Technology (Seminar) (475)
Law Students Civil Rights Research Council (496)
Law Students in Court (495)
Legal Activism (498)
Legal Aid (493)
Legal Aspects of International Business Transactions (446)
Legal Writing (314)
Legislation (362)
Local Government Law (409)
Mediation (303)
The Modern Corporation (Seminar) (336)
Modern Real Estate Transactions (398)
Moot Court (312)
Patent Law (464)
Patent Office Practice (466)
Performance of Government Contracts (488)
Planning, Zoning, and Land Use Law (402)
Problems of the Consumer (460)
Products Liability (454)
Public Policy and Mass Media (352)
Regulation of Securities Markets (328)
Remedies (380)
Sales and Sales Financing (370)
Securities Regulation (326)
Taxation—Federal Estate and Gift (422)
Taxation—Federal Income (420)
Taxation—Federal Income, Corporations and Shareholders (424)
Taxation—Partnerships and Subchapter S (426)
Trial Advocacy (311)
Trial Practice Court (302)
Trusts and Estates I (390)
Trusts and Estates II (391)
Unfair Trade Practices (450)
United Nations Law and World Order (447)
U.S. Foreign Relations Law (443)
Women and the Law (484)

## ADVANCED COURSES AND SEMINARS (NUMBERED 500–699)

Accounting Aspects of Federal Income Taxation (573)
Chemical Patent Practice (553)
Chinese Law (570)
Communications Law (572)
Comparative Environmental Law (551)
Control of Toxic and Hazardous Substances (548)
Copyright Law (559)
Crime Lab, the Forensic Scientist, and the Criminal Lawyer (532)
Energy (549)
Environmental Planning (544)
Equal Employment Claims and Litigation (527)
Equal Employment Opportunity (524)
Food and Drug Law (509)

Graduate Clinical Studies (596)
Health Care Delivery Systems (Seminar) (508)
Income Taxation of Foreign Business and Investment (583)
Independent Studies (597)
Internal Union Affairs (522)
International Humanitarian Law of Coercion Control (568)
International Law of Air and Space (566)
International Law of Human Rights (565)
International Law of the Sea (567)
International Negotiations (571)
Labor Litigation Seminar (526)
Labor Relations in the Federal Service (521)
Labor Standards (520)
Law and Economics (502)
Law of Criminal Corrections (535)
Law of Real Estate Financing (538)
Legal Research and Writing (Foreign Students) (620–621)
Legislative Drafting (591)
Natural Resources Law (546)
Negotiation: Concepts and Techniques (563)
Patent and Know-how Licensing (552)
Patent Law, Advanced Topics (554)
Practical Economics for Lawyers (500)
Public Economic Policy and the Law (501)
Research in Patent, Trademark, and Copyright Law (555)
Research in Public Law (598)
Soviet Law (569)
Survey of the Secondary Mortgage Market (539)
Tax Practice and Procedure Seminar (588)
Income Taxation of Property Transactions (584)
Taxation—Deferred Compensation I (586)
Taxation—Deferred Compensation II (587)
Taxation—Exempt Organizations (578)
Taxation—Real Estate and Income (579)
Taxation—Special Corporation Problems (577)
Taxation—State and Local (581)
Thesis (599–600)
U.S. Regulation of International Trade (505)
Use and Control of Nuclear Energy (550)
Water Resources Law (543)

## COURSES NOT OFFERED 1988–1989

Administration of Criminal Justice (Seminar) (307)
Administrative Law (Seminar) (344)
Administrative Practices and Procedures (Food and Drug Administration) (510)
Advanced Civil Procedure: Complex Litigation (308)
Appellate Practice and Procedure (364)
Arms Control and Strategic Stability (564)
Civil Procedure (Seminar) (310)
Civil Rights Legislation (359)
Comparative Labor Law (Seminar) (518)
Criminal Practice (Seminar) (534)
Federal Income Taxation of Trusts, Estates, and Beneficiaries (585)
Individual Rights and Liberties (358)
Intergovernmental Relations I (541)
International and Comparative Patent Law (558)
International Civil Litigation (449)
International Law (Seminar) (448)
Labor Law (Seminar) (341)
Law of Congress and the Presidency (Seminar) (347)
Law of Privacy (469)
The Legal Process (320)
Medicine for Lawyers (470)
Occupational Safety and Health Legislation (415)
Police and the Community (480)
Public-Sector Labor Law (Seminar) (529)
Regulated Industries (345)
Regulation of Investment Advisers and Investment Companies (507)
Securities Aspects of Corporate Finance (327)

Special Problems of Tax Policy (Seminar) (428)
Statistics and the Law (503)
Taxation—Oil and Gas (580)
Taxation—Principles of Charitable T... Planning (582)
Trade Regulation (Seminar) (462)
U.S. Trademark Law (560)

## COURSE DESCRIPTIONS

The courses of instruction are described below. The number of hours of credit given for the satisfactory completion of a course is indicated in parentheses after the name of the course. Thus, an academic-year course with two hours of credit each semester is marked (2–2) and a semester course with two hours of credit is marked (2).

In most courses, a final examination is held during the examination period and the grade in the course is determined in large part by that examination. These courses are marked "Examination."

Courses that require the preparation of a major research paper in lieu of an examination are marked "Research Paper." The satisfactory completion of such a paper by a student individually will satisfy the Legal Writing curriculum requirement for the J.D. degree.

Courses marked "Problem Assignments," "Writing Assignments," "Take-home Examination," "Choice of Paper or Examination," or "Clinical Work" indicate the nature of the method planned by the instructor for determining in major part the grade to be given for the course. Only research papers qualify for the Legal Writing curriculum requirement for the J.D. degree.

Day classes begin at 9:10 a.m. and run throughout the entire morning and afternoon. Evening classes begin at 5:50 p.m. Many examinations for both day and evening classes may be given in the afternoon only. Examinations for day students may be held in the evening.

A designation at the end of a course description indicates whether the course is scheduled to be offered in the spring or fall semester or in the summer sessions and also usually whether it will meet in the day or evening. When a double-numbered course is designated "Academic year," the first half of the course is scheduled to be offered in the fall, the second half in the spring.

## REQUIRED COURSES

**203–4 Contracts I–II (3–3 day) (4–2 evening)** Nash, Cibinic, Poo... Caplan, Wilmarth

Legal remedies of contracting parties, including damages in contract and quas... contract, specific performance, reformation, rescission, remedies in tort, acts creating and terminating contractual rights, including offer and acceptance, mistake, problems of proof, function of consideration, conditions, assignments, third-party beneficiaries, effect of changed circumstances; protection of the client's interests upon breach or threat of breach by the other party. Emphasis on problems of analysis, draftsmanship, adversary method. (Examination) (Academic year—day and evening)

**207 Torts (4)** Seidelson, Banzhaf, T. Schwartz, Sirulnik, Reitze, Dienes, Schechter

Liability for harm to person or property. Intentional torts, negligence, nuisance, products liability, misrepresentation, defamation, and invasion of privacy; fault and other basis for shifting losses, causation; damages; effects of liability insurance; problems under Federal Tort Claims Act. (Examination) (Fall—day and evening)

**211 Property (4)** Starrs, Schiller, Brown, Chandler, J. Schwartz, Johnston

Basic concepts of personal property. Real property: historical background of the law... estates and conveyancing, types of estates, dower and curtesy; landlord and tenant...

relationship, concurrent estates, future interest at common law and after the Statute of Uses; introduction to modern conveyancing—the real estate contract, the deed, the recording system, methods of title assurance. (Examination) (Spring—day and evening)

213 **Constitutional Law I (Federal Systems)** (3) Barron, Park, Cheh, Dienes, Nolan
Basic principles of American constitutional law, with a focus on governmental powers and the role of the Supreme Court in interpreting and enforcing constitutional norms. The nature and scope of judicial review. The case and controversy requirement and other limitations on constitutional adjudication. Powers of the president and Congress; the seperation of powers doctrine. Relationship of the national government to state governments and principles of federalism. The state action doctrine. (Examination) (Spring—day; fall—evening)

214 **Constitutional Law II (3)** Barron, Park, Cheh, Dienes, Nolan, Zacharias
Individual rights and liberties in the American constitutional scheme and the different judicial methods of reconciling majoritarian governance with individual freedom. Privileges and immunities of national citizenship, due process of law, equal protection guarantees, freedom of expression and of religion, rights of privacy and association. (Examination) (Fall—day; spring—evening)

216 **Criminal Law (3)** Starrs, Robinson, Sirulnik, Caplan, Craver, Sonenshein
An overview of the criminal justice system; dimensions of the problem of crime and goals of penal sanctions. An examination of what conduct should be made criminal and what sanctions should be applied. The theoretical anatomy of a criminal offense (elements of *mens rea* and *actus reus*), the general principles of criminal liability, and the various defenses. Special problems, such as conspiracy, inchoate crimes, causation, insanity, and complicity, are subjected to detailed analysis. (Examination) (Fall—day; spring—evening)

217 **Criminal Procedure (3)** Starrs, Robinson, Sirulnik, Caplan, Sonenshein
Comprehensive presentation of major issues in criminal process, with heavy reliance on Supreme Court cases interpreting the constitution. The course proceeds through the criminal justice system, from first police contact, search interrogation, and other investigation, through the prosecution, preliminary proceedings, and trial. Problems of federalism, the exclusionary rule, and sentencing. (Examination) (Fall and spring—day; summer 1988)

218–19 **Civil Procedure I–II (3–3)** Sharpe, Barron, T. Schwartz, Cheh, Raven-Hansen, Reitze, Trangsrud, J. Schwartz, Hoptman, Peterson
The theory and practice of civil litigation. Analysis of the goals, values, costs, and tensions of an evolving adversarial system of adjudication. Examination of the rules and statutes that govern the process by which substantive rights and duties are enforced in our federal and state courts. Topics include the relationship of procedure to substantive law, the proper reach of judicial authority, pleading, motions practice, joinder of parties and claims, class actions, pretrial discovery, trial by jury, remedies, post-trial procedure, appeals, claim and issue preclusion, and alternative dispute resolution. (Examination) (Academic year—day and evening)

220 **Legal Research and Writing (2)** Staff
Introduction to use of a law library; research experience in primary, secondary, and specialized sources of law; practice in proper legal citation form. Instruction and practice in legal writing. The grade *H* (Honors), *CR* (Credit), or *NC* (No Credit) is given for this course. For Honors, a student must do work of excellent quality. For Credit, a student must attain a minimum grade of 65. Failure to complete the work in this course will result in a grade of 45. (Fall—day and evening)

221 **Moot Court (1)** Staff
Instruction and experience in the writing and rewriting of an appellate court brief and in the argument of an appellate case. This course must be successfully completed in order to earn credit for Law 220. The grade *H* (Honors), *Cr* (Credit), or *NC* (No Credit) is given for this course. For Honors, a student must do work of excellent quality. For

Credit, a student must attain a minimum grade of 65. Failure to complete the work in this course will result in a grade of 45. (Spring—day and evening)

**222 Professional Responsibility and Ethics (2)** Cibinic, Green, Jenkins, Nolan, Sharpe, Johnston, Pryor

Required prior to graduation for all students entering in the fall 1983 semester and thereafter. May be taken in the second, third, or fourth years. Ethical problems involved in civil and criminal counseling and litigation. Codes of Professional Responsibility and legal discipline; roles of bar associations and courts. (Examination) (Fall and spring)—day and evening; summer 1988)

**232 Evidence (4)** Seidelson, Robinson, Schechter, Stou

Preparation and presentation of evidence, including proof of writings; qualification and examination of witnesses with emphasis on impeachment, privilege, opinion testimony, determination of relevancy; demonstrative, experimental, scientific evidence; application of the hearsay rule. (Examination) (Spring—day and evening; summer 1988)

## ELECTIVE COURSES

**300 Federal Jurisdiction (3)** Barron, Raven-Hansen, Trangsrud, Hoptman, Peterson, Bretschneider

Relationship of federal courts to Congress and to the states, through analysis of cases dealing with federal judicial functions (including problems of advisory opinions, standing to litigate, justiciability), federal questions in federal courts, federal review of state court decisions (including relation between state and federal substantive law), procedural problems in exercising review, application of law to fact) (Examination) (Fall—day; spring—day and evening)

**302 Trial Practice Court (2)** Pryor, Ryan, Stevas, Barnes, Jamborsky, Jackson, Levin, Sirulnik

Trial of assigned cases, trial techniques, pre-trial and courtroom procedures pursuant to federal rules. Students may repeat this course once for credit. Prerequisite 42 semester hours, including Law 218. Prerequisite or concurrent registration Law 242. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—evening)

**303 Mediation (2)** Lewis, Singer

Consideration of the growing use of mediation to resolve disputes. Comparison of mediation with other forms of dispute resolution; applicability to various areas of the law, including family, criminal, environmental, and civil rights. Students participate in simulated disputes, both in and outside class, designed to familiarize them with the process of mediation and to raise a number of practical and ethical questions about its applications. Students keep short journal entries describing their experiences as mediators or disputants and write a 10–20 page paper either exploring a particular application of mediation or discussing legal or ethical questions involving mediation. Enrollment limited to 24. (Fall—day)

**304 Appellate Practice and Procedure (2)**

Study through text and an examination of the appellate process. The course is centered around the discussion of a series of fundamental concepts. (Research paper)

**307 Seminar: Administration of Criminal Justice (2)** Robinson

Group study of current problems in criminal law and its administration, including recent developments in preventive detention, standards of effectiveness of defense counsel representation, capital punishment, the permissibility, propriety, and efficacy of legal efforts to control life-style choices such as nonmarital sexuality, and related topics of interest to members of the seminar. Students will be expected to prepare one analytic paper and two critiques of papers of others. Enrollment limited. (Research paper)

308 **Advanced Civil Procedure: Complex Litigation (3)** Trangsrud
Complex civil litigation in the federal courts, modern class actions, and the use of the injunction as a tool for institutional reform and the implementation of public policy. Emphasis on one or more of the following topics: modern injunction theory; alternative procedures for managing complex public and private litigation; the issues of representation, class conflicts, and judicial supervision of plaintiff and defendant class actions; the role of juries, magistrates, and masters in complex cases; government by injunction in free speech cases and in the reform of public schools, hospitals, and prisons; and the use of the contempt sanction. (Examination)

310 **Seminar: Civil Procedure (2)** Hoptman
Study of specific problems in civil procedure. Topics will vary. The topic will be announced each year prior to registration. (Research paper)

311 **Trial Advocacy (3)** Mauet, Zacharias
Pretrial and trial techniques with emphasis on procedural, evidentiary, tactical, and ethical problems experienced by trial lawyers in actual cases. Complaint drafting, pretrial motions, depositions and other discovery methods, preparation of witnesses, jury selection, the use of experts, direct and cross-examination, introduction of documents, courtroom techniques, and opening and closing arguments. Role playing in simulated courtroom situations. Prerequisite: Law 232. (Short papers and exercises) (Fall—day and evening; spring—day)

312 **Moot Court (1 or 2)**
Satisfactory participation in an upper-class competition results in one hour of academic credit. Finalists in an upper-class competition receive two hours of academic credit. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring)

314 **Legal Writing (1 or 2)** Staff
Preparation of a research paper under the supervision of a full-time member of the faculty who will determine, prior to registration, whether the work required for the topic selected justifies one or two semester hours of credit. If elected for one hour of credit, this course may be repeated to meet the legal writing requirement for the degree. Approval of the faculty member is required prior to registration. See recommended guidelines under Regulations, Research Papers. (Research Paper) (Fall and spring—as arranged; summer)

318 **Seminar: American Legal History (2)** Wilmarth
Philosophical and historical roots of the American Constitution, with consideration of the writings of Locke, Hobbes, and Montesquieu, the natural law and social contract theories; and the application of these concepts in the debates surrounding the drafting and ratification of the Constitution. The degree to which these concepts have been reflected in decisions of the Supreme Court, with primary focus on the Marshall Court but consideration also of more recent decisions. (Choice of two short papers or examination or one long paper that can satisfy research paper requirement.) (Fall—day)

320 **The Legal Process (3)** Robinson, Levine
American legal institutions and their interrelationships and processes. Jurisprudential concepts in the context of specific problems commonly faced by private and governmental lawyers, legislators, courts, and administrative agencies. Issues of statutory interpretation, the roles of courts in making new law, and the allocation of functions between courts, administrative agencies, legislatures, and private decision makers. (Examination)

322 **Agency and Partnerships (2)** Sharpe, Schiller
Employment relations, vicarious liability of employers for employees' torts, scope of employment, and independent contractors; agents' authority and apparent authority to contract for their principals, ratification; nonprofit associations; the formation, operation, and termination of partnerships; limited partnerships. (Examination) (Fall—day and evening)

**324 Law and Accounting (2)** Cibinic, Taubman
Study of fundamental accounting principles with emphasis on corporation accounting; legal and accounting implications of specific items in financial statements; corporations; inventory adjustments; corporate transactions, distributions, capital adjustments. Strongly recommended for students who have had no accounting. Examination and Problem Assignments) (Fall—evening)

**325 Corporations (4)** Green, Solomon, Park, Chen, Wilmarth, Painter, Oldham
Corporate law, with emphasis on operations and financing of corporations. Control of corporations, action by corporate directors, officers, shareholders. Control devices. Directors' and shareholders' duties of care and loyalty, insiders' transactions in shares of the corporation. Derivative suits, kinds of shares, dividends, corporate distributions. (Examination) (Fall—day and evening; spring—day)

**326 Securities Regulation (3)** Green, Stock
The basic course in the study of federal and state laws governing the offering, distribution, and trading of securities. Focus on federal laws and regulations, in particular the Securities Act of 1933, the Securities Exchange Act of 1934, and the enforcement of these laws by the SEC and private parties. (Examination) (Fall—day; spring—evening)

**327 Securities Aspects of Corporate Finance (2)** Stock
Federal and state regulation of securities transactions, such as tender offers, the regulation of investment companies, and new types of securities markets, including the options and futures markets. Prerequisite: Law 325 and 326. (Research Paper)

**328 Regulation of Securities Markets (2)** Painter
Operation of over-the-counter and exchange markets, including competitive and monopolistic practices in each market; relationship of antitrust laws and securities regulations to concept of a free and open marketplace; role of regional exchanges and third market in providing competitive element in market; advantages and disadvantages of a fragmented market; minimum fee structure; rebates and their effect on merchandising of securities and financial soundness of industry; use and availability of economic data in evaluating performance of marketplace. The seminar will examine matters directly of interest to graduate law students, lawyers, economists, and political scientists. (Take-home Examination) (Spring—evening)

**332 Banking Law I (3)** Clark
Federal regulation of the financial services industry, especially commercial banks. Includes an analysis of the Federal Deposit Insurance Corporation as insurer of deposits, receiver, and liquidator of troubled banks; the role of the Comptroller of the Currency as the primary federal regulator of national banks, including the chartering function, bank examinations, analysis of classified loans, capital adequacy, and enforcement of substantive federal legislation; operation of the Federal Reserve System under the Bank Holding Company Act and the various substantive regulations such as Reg. B (equal credit opportunity), Reg. J (check collection), Reg. M (consumer leasing), Reg. Q (deposit rate regulation), Reg. O (insider loan limits), Reg. E (electronic funds transfer), and Reg. Z (truth in lending); geographic deregulation and the trend toward interstate banking; and an analysis of financial services product deregulation and unification of the industry along functional lines. (Examination) (Fall—day)

**333 Banking Law II (2)** Clark
Bank holding companies; activities closely related to banking under FRB Regulation Y; outer limits of the business of banking; banks, bank holding companies, and the securities laws; savings and loan holding companies, Change in Bank Control Act; the FDIC and the troubled bank; bank liquidation and purchase and assumption arrangements; federal deposit insurance; the FDIC as receiver of a failed bank; international banking, including foreign banks in the United States, U.S. banks abroad, and foreign bank regulation of American banks abroad. (Examination) (Spring—day)

334 **Business Planning** (2) Green, Flyer, Press, Cooney, Cohen, Block, Cirulnick, Painter, Kirby

Integrated study of corporate, financial, tax, accounting, and SEC aspects of the following: organization of a small corporation; organization of a public corporation; stock dividends, recapitalization, and stock purchases in the context of conflict between active stockholders of a closed corporation and the family of a deceased active stockholder; corporate liquidations; corporate mergers and acquisitions; and divisions of corporations. Prerequisite: Law 325 and 420. Berkeley, Press—prerequisite: Law 424; Flyer, Cirulnick—prerequisite or concurrent registration: Law 424. Enrollment may be limited by the professor. Berkeley, Green, Press, Flyer, Cirulnick, Painter—(Problem Assignments); Block, Cohen, Kirby—(Examination) (Fall and spring—day and evening; summer 1988)

336 **Seminar: The Modern Corporation** (2) Solomon

Analysis of the nature and role of the business corporation in the American and transnational political economy; evolution of the corporation and the political economy; impact of technological change on the corporation and the political economy; reasons for and consequences of the growth of large corporate enterprises; role of entrepreneurs in the political economy; relationship of corporations to the government and other centers of power. (Research Paper) (Fall—day)

338 **Labor Law** (3) Rothschild, Craver

Law governing labor–management relations, organizations and representation of employees, regulation of economic weapons, enforcement of collective bargaining agreements, interunion and intra-union relations. (Examination) (Fall—day and evening)

340 **Collective Bargaining and Labor Arbitration** (3) Rothschild

Collective labor agreement: content, negotiation, administration through grievance procedure and arbitration; problems in settlement of labor disputes. Prerequisite: Law 338 (Problem Assignments) (Spring—evening)

341 **Seminar: Labor Law** (2)

Group study of contemporary problems of labor law. Prerequisite: Law 338. (Research Paper)

342 **Administrative Law** (3) Park, Banzhaf, Barron, T. Schwartz, Raven-Hansen, J. Schwartz

Study of the administrative process in executive and independent regulatory agencies; emphasis on judicial review. Formal and informal decision-making, investigation, planning, and public administration functions of the agencies as related to their legal limits and to the roles of lawyers in government and private practice. Relationships of agencies to the executive and legislative branches, to public and private interest groups, and to the social, political, and economic aspects of various philosophies of government regulation. Park and Banzhaf—(Examination) (Fall—day; spring—day and evening; summer 1988)

344 **Administrative Law Seminar** (2) Raven-Hansen

Group study of specific problems in administrative law. Topics will vary. In the fall semester, the course will focus on the Executive Branch. Prerequisite: Law 342. (Research Paper)

345 **Regulated Industries** (2) Park, Schechter

Substantive problems of business regulation in terms of natural monopolies, licensed industries, subsidized industries, and safety regulation. Typical problems raised include the role of intervenors, the impact of regulation upon management and market behavior, the uses and abuses of economic evidence, the role of agencies' staffs, interagency planning and regulation, and the effects of judicial and legislative review. Each student selects one industry and develops an insight into economic regulation in terms of that industry's firms, market structure, growth and development, trade associations, and regulatory agencies. (Research Paper)

**347 Seminar: Law of Congress and the Presidency** (2) Dienes, Raven-Hans

A seminar study of the law governing the powers and relations of Congress and the Presidency and attendant separation of powers questions, including executive confidentiality and the congressional need for information, the President's legislative role, presidential accountability, executive law enforcement, supervision within the executive branch, executive appointments and removals, the President's supervision of foreign policy, and the constitutional allocation of war powers. Intensive preparation required, and students are expected to prepare and present one analytic paper and two critiques of papers by others. Enrollment limited. (Research Paper)

**350 Seminar: Constitutional Law** (2) Cheh, Dienes, Nolan, Peters

Group study of contemporary problems in constitutional law, process of constitutional litigation; problems of effectuating constitutional guarantees. Limited enrollment. Cheh, Dienes—(Research Paper or Examination); Nolan—(Research Paper) (Fall—day)

**352 Public Policy and Mass Media** (2) Barron, Plesser, Hamme

Institutional structure of mass media and their interrelationships; psychological aspects of mass communications, continuing adjustments among public interest goals, the economic system, and technological developments; influence of and control exercised by government, other institutions, and private groups, conflict between freedom of speech of the media and other major community interests; the media's relationships to the interests of dissident and minority groups and the access of these groups to the media. (Examination or Research Paper) (Fall—evening; spring—day)

**358 Individual Rights and Liberties** (3) Dienes, Park

Principles of equality and due process in the Fifth and Fourteenth Amendments. The power of Congress to enforce the Fourteenth Amendment. Focus on individual rights and liberties under the U.S. Constitution. First Amendment rights, particularly religion and speech clauses. The right of association. Other personal rights in the Bill of Rights. Methodology of judges in deciding cases involving individual rights and liberties, particularly the "balancing test" and the judges' views of societal interests. Prerequisite: Law 212. Park (Examination); Dienes (Research Paper or Examination)

**359 Civil Rights Legislation** (3) Dienes

Examination of federal legislation protecting individual rights and liberties as well as the administrative and judicial implementation of that legislation. Remedial provisions for the enforcement of federal constitutional and statutory rights (*e.g.*, 42 U.S.C. §§1983, 1985) and federal statutes prohibiting discrimination in housing, contractual relations, voting, education, and federally funded programs. (Examination)

**360 Immigration Law** (2) Grusendorf

Law and practice under the McCarran–Walter Act, involving questions of immigration, emigration, expatriation, nationality, and naturalization. Consular, Immigration and Naturalization Service, and Labor Department practice. (Examination) (Fall—evening)

**362 Legislation** (2) Clark, Raven-Hansen

Legislative process and roles of participants in the process; operation of United States Congress and state legislatures, including fact finding, organization, procedure. Statutory interpretations emphasized to provide foundation for more advanced courses. (Examination) (Spring—day)

**364 Current Decisions** (1 or 2 per semester) Staff

Limited to members of the student staff of the *Law Review*. A maximum of 4 semester hours of credit may be earned in this course. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—day and evening)

**366 Journal of International Law** (1 or 2 per semester) Staff

Limited to editors of the student staff of the *Journal of International Law and Economics*. A maximum of 4 semester hours of credit may be earned in this course

The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—as arranged)

370 **Sales and Sales Financing** (2) Rothschild, Zubrow, Clark
Provisions of the Uniform Commercial Code relating to sale and distribution of goods, including bulk transfers, warehouse receipts, bills of lading, and other documents of title; particular attention to secured transactions and financing devices utilized in this connection. (Examination) (Fall—day and evening; spring—day)

372 **Commercial Paper, Check Collection, and Banking** (2) Rothschild, Zubrow, Clark, Spanogle
Classic view of negotiable instruments as codified by Article III of the Uniform Commercial Code. Check collection: the system in theory as expressed in Article IV of the Uniform Commercial Code and the system in practice; Federal Reserve regulations, Clearing House agreements, and automation systems. The dual banking system, work of the Comptroller General and the Federal Reserve Board. Legal problems concerning interest and the checkless society. (Examination) (Fall—day and evening: spring—day)

378 **Creditors' and Debtors' Rights** (3) Cheh, Zubrow
Creditors' remedies and debtors' protections under state law: writs of attachment, garnishment and execution, acquisition of liens and forced sales of property, self-help arrangements, and security agreements. Bankruptcy under federal law: who may file, the creation and administration of the bankruptcy estate, powers of the trustee, discharge of debt; rehabilitation plans for individuals under Chapter 13. (Examination) (Spring—day and evening)

380 **Remedies** (3) Cibinic, Nash, Park, Zubrow, Trangsrud, Sharpe, Pock
Development and use of judicial remedies that give relief for past or threatened injuries to interests of personalty and property. Remedial approaches include compensatory and punitive damages, injunctions, unjust enrichment, constructive trusts, equitable liens, tracing, subrogation, and specific reparation. Emphasis on comparing remedial options in fraud, mistake, duress, breach of contract, and abuse of fiduciary relationships. Cibinic, Sharpe—(Examination); Nash—(Problem Assignments) (Fall—evening; spring—day)

382 **Insurance** (2) Schiller, Pock
A primary risk-distributing medium and the rules by which legislative, administrative, and judicial bodies seek to promote its benefits and avert its dangers. Insurance marketing, insurable interest, subrogation, transfer of insurance benefits to non-policyholders, coverage and other insurance policy provisions, disposition of claims. (Examination) (Fall—evening; summer 1988)

386 **Admiralty** (3) Sharpe
United States law of transportation by water (vessels, cargoes, services, and persons). Substantive maritime law; procedures of resolving maritime disputes by litigation, arbitration, and administration. Legal aspects of processes such as planning shipping transactions; anticipating disputes through contract, statute, and treaty; creating and amending national and international shipping law; adjusting conflicts between courts and advancing toward a uniform maritime law. (Examination) (Spring—day)

390–91 **Trusts and Estates I–II** (3) Chandler, Solomon, Sims, Johnston
Noncommercial transfers of wealth at death or during life. Law 390: essential elements and formalities for creation of trusts and execution of wills, revocation and alteration, grounds for contest, limits on property owner's power to control, intestate succession. Law 391 dispositive provisions, common questions of construction, future interests problems, administration of estates and trusts, charitable trusts. Prerequisite to Law 390: Law 211; to Law 391: Law 390. (Examination and Problem Assignments) (Law 390: fall—day and evening; spring—day; Law 391: spring—day)

**394 Community Property/Marital Property (2)** Oldham, Rock
Legal rules and planning considerations with respect to property owned and acquired by married persons. Primary emphasis will be on the law of the eight community property states, but special attention will also be given to the parallel problems under the now widely enacted statutes creating judicial power to decree an equitable distribution of a divorcing couple's marital property. As time permits, federal tax rules and considerations will also be discussed. (Research Paper or Examination) (Fall—evening; spring—day)

**395 Seminar: Estate Planning (2 or 3)** McCoy, Solomon, Blake
Study of the effective disposition of wealth by inter vivos gift and testamentary transfer, emphasis on income, estate, and gift tax considerations, use of the trust form in the transfer of wealth; use of insurance and jointly held property as part of the estate plan; planning for the continuation or disposition of the client's business interests. Preparation of an estate plan with supporting documents is the major project for the course. Prerequisite: Law 390, 391, 420, and 422. Enrollment limited by the instructor. Solomon—(Problem Assignments); McCoy—(Choice of Problem Assignments or Research Paper); Blake—(Examination) (Fall—evening)

**398 Modern Real Estate Transactions (3)** Brown, Schiller
Basic course in conveyancing. Current problems in purchase and sale of residential real estate; legal and equitable rights, responsibilities, liabilities, and remedies of buyer, seller, broker, escrow agent, conveyancing attorney, surveyor, title examiner, abstractor, and lender; interim and permanent mortgage finance, discounts, points, "subject-to" and "assumptions," remedies on default, including foreclosure processes; process of examination and assurance of title and other interests in realty, including recording, registration, and title insurance systems; settlements and closings, warranties of title, habitability and structural integrity; risk-of-loss problems, property/casualty insurance; use restrictions, encumbrances on title, and clearing title; problems related to encroachments, easements, adverse possession, and compliance with subdivision, zoning, building, and housing code regulations; emerging problems related to cooperatives, condominiums, and property owners associations. (Examination) (Spring—day)

**402 Planning, Zoning, and Land Use Law (2)** Feola, Gordon
*(Formerly Land Use Control)*
Problems, solutions, emerging concepts, and constitutionality of land use regulations, including zoning, subdivisions, historic preservation, exactions, vested rights, transfer of development rights, growth management, and urban and regional planning. This course provides the foundation for Law 403, 404, and 408. (Writing Assignments and Examination) (Spring—evening)

**403 Seminar: Current Problems in Land Use Management and Control (2)** Brown, Schiller
The constitutional "taking" issue: assessment of emerging mechanisms, processes, and institutional innovations for exercising public and private management and control of land use; consideration of regional regulatory standards for land use as a desirable or necessary alternative to local controls and of the prospect that such process will satisfy the *Nollan* "nexus" requirement; critical analysis of TDRs, linkage and other off-site exactions, impact fees, proffers, etc.; problems of affordable housing and available responses. Students may participate in microsimulation activities. (Research Paper) (Spring—day)

**404 Land Use Administrative Process (2)** Delaney
*(Formerly Land Use Planning)*
Selected problems in urban development and housing, with particular emphasis on programs under current enabling legislation and federal and state court decisions. Analysis of various public and private decision processes through which conflicts over land use are resolved. Simulation of a complex zoning hearing. Prerequisite: Law 402 or permission of instructor. (Writing Assignments) (Fall—evening)

408 **Land Development Law (4)** Brown
(Simulation course)
Students participate in a semester-long simulation process encompassing 42 months of "game time." As junior associates in various hypothecated law firms or offices, students represent their assigned clients, with all interactions based on actual situations and often incorporating recent or ongoing cases of major significance. All levels of judicial, administrative, and legislative activity are involved. Enrollment limited by instructor. (Writing Assignments) (Fall—day; summer 1988)

409 **Local Government Law (2)** Brown
Decision-making processes in metropolitan and other municipal-level governments; types and objectives of city, county, and special-function local government units; intra- and intergovernmental relations; initial organization and changes in form and function of local governments; personnel matters; local legislative and administrative authority and processes; financial processes; governmental vs. proprietary functions; responsibility in tort; insurance issues; introduction to community planning; extraterritorial powers; joint-power agreements and compacts. (Examination or Research Paper) (Fall—day)

410 **Environmental Law I (3)** Reitze
An introductory course focusing primarily on the statutes administered by the Environmental Protection Agency. Topics covered include NEPA, hazardous substance control, and radiation. (Examination) (Fall—day; spring—evening)

411 **Environmental Law II (3)** Reitze
An in-depth analysis of the Clean Air Act, focusing on legal problems common to environmental law. Topics covered include standard setting, technology-based controls, development of pollution control plans, monitoring, inspection, enforcement, economic controls, energy trade-offs. (Examination) (Spring—day)

414 **Clinical Studies in Environmental Law (2, 3, or 4)** Reitze
The student works on a project in the environmental law field under the supervision of both the faculty director of the program and a lawyer practicing environmental law. The project may involve working with a government agency, a Congressional committee, a private practitioner, or a nonprofit public-interest environmental organization. Admission to the course requires second-semester second-year, third-year, or graduate standing and permission of the Director of the Environmental Law Program. Students who have mastered the fundamentals of environmental law are selected for this course. Normally this will require completion of at least Law 410. Students may repeat the course for a maximum of 8 semester hours of credit. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. Five hours of work per week are required for each credit. (Fall and spring—day)

415 **Occupational Safety and Health Legislation (2)** Reitze
Workers' compensation, third-party tort actions, the Occupational Safety and Health Act of 1970. (Examination)

420 **Taxation—Federal Income (3)** Solomon, Sims, Block, Hoptman, Mundstock
Survey of substantive provisions of federal income tax law, including concept of gross income; provisions affecting taxation of family and individual transactions; limitations on allowable deductions; sales and dispositions of property; problems of capital gains taxation; nontaxable exchanges. (Examination) (Fall and spring—day and evening)

422 **Taxation—Federal Estate and Gift (2)** Solomon
Survey of substantive provisions of federal estate and gift tax laws, including inter vivos transfers, transfers in contemplation of death, joint interests, life insurance proceeds, property subject to powers of appointment, marital deduction, and split gifts; tax procedure. (Examination) (Spring—day)

424 **Taxation—Federal Income, Corporations and Shareholders (3)** Solomon, Sims, Block, Painter, Mundstock
Continuation of Law 420. Primary emphasis on corporate–shareholder relationships. Problems of corporate dividends, redemptions of stock, distributions in partial and

complete liquidation, stock dividends, bail-outs, and dividends in kind. Re... income tax problems involved in the formation of corporations, the sale of corp... businesses (including collapsible corporations), mergers and acquisitions, an... porate divisions. Prerequisite: Law 420. (Examination) (Fall—day and eve... spring—day)

**426 Taxation—Partnerships and Subchapter S (2)** Sanders, Black

Income tax problems of partnerships and tax-option corporations (Subchapters K ... S of the Internal Revenue Code of 1954). Practice-oriented study of partner... including syndication, organization, and structure of entity, with emphasis ... examination of areas of IRS principal concern, including tax shelters, disprop... tax allocations, retroactive allocations, guaranteed payments to partners, contribut... of capital, basis for gain or loss, non-recourse financing, "at-risk" rules, current a... liquidating distributions, sale of partnership interests, collapsible partnerships, "in... kind" exchanges, termination, special basis adjustments, and distributions to retiring or deceased partners. Planning-oriented analysis of Subchapter S, including p... cedures for electing and terminating Subchapter S status, treatment of income, ... losses, limitations on deductibility of losses, and how to avoid pitfalls. (Examin... tion) (Spring—evening)

**428 Seminar: Special Problems of Tax Policy (2)** Sims, Black

Intensive study of selected aspects of the tax structure with primary attention give... the federal income tax. Problem areas are reviewed primarily from the standpoint... tax policy, including legal, economic, social, and practical considerations. Alter... solutions, including current legislative proposals, are examined. Prerequisite: L... 420, 424. (Research Paper)

**434 Domestic Relations (2)** Oldham, Black

Marriage, annulment, and divorce; adoption and custody of children, econo... relations. (Examination) (Spring—day; summer 1988)

**437 Seminar: Law and Psychiatry (2)** Firestone

Designed to expose the lawyer to basic constructs of psychiatry and psychology and ... explore their implications in legal rules and practice. Psychiatrists and psychologists ... actively involved in teaching process. Topics include psychological testing and other ... assessment techniques, psychiatric evaluations and reports, child custody and other ... family law issues, privilege and confidentiality, competency in civil and criminal ... contexts, criminal law matters (including criminal responsibility and disposition ... issues), civil commitment, right to treatment, right to refuse treatment, experimental ... procedures, and informed consent. Problems of counseling, legal ethics, preparation ... for trial, direct and cross-examination, and other aspects of practice considered. There ... is ordinarily at least one session in a mental institution. (Choice of Research Paper or ... Examination) (Spring—evening)

**438 Comparative Law (3)** Brand

Comparison of the world's major legal systems: civil, common, Islamic, and socialist. ... Consideration of the history and sources of law of each and a review, concentrating on ... the civil law system, of hallmark institutions, the role of lawyers, procedure, ... selected substantive legal issues. Emphasis on issues and problems of the internat... tional lawyer, including conflicts among and harmonization of the legal systems, ... migration of legal ideas, and pleading and proving foreign law. (Research Paper or ... Examination) (Spring—day)

**440 Conflict of Laws (3)** Seidelson, Pock, Steinhardt

Legal problems arising from occurrences transcending state or national boundaries; ... jurisdiction; foreign judgments; constitutional influences; theoretical bases of choice ... of law principles and their application to specific fields, including torts, contracts, ... property, family law, administration of estates, business associations. (Examina... tion) (Fall—evening; spring—day; summer 1988)

**442 Jurisprudence (2)** Park, Chandler, Chen, Steinhardt, Nolan

Basic jurisprudential concepts; nature of law; development of legal institutions; ... prudential schools—natural law, analytical, historical, sociological, functional; law ...

logic, law and justice, the judicial process, legislative, executive, administrative decision making, impact of politics, economics, and scientific advance on legal systems, contemporary trends in jurisprudential thought. Park, Cheh, Nolan, Steinhardt—(Examination); Chandler—(Research Paper) (Fall—day, spring—day and evening)

443 **U.S. Foreign Relations Law** (2) Chandler, Buergenthal
Seminar involving the study of foreign relations law. Materials to be read and discussed relate to the Constitutional and other public law problems that arise in the development and conduct of U.S. foreign relations. (Research Paper) (Spring—evening)

444 **International Law and World Order** (3) Steinhardt, Buergenthal
An introduction to international law that provides the background for specialized seminars. Emphasis on national states as participants in decision-making processes, with consideration of public bodies and other participants; analysis of range of available sanctions, roles and effects of international agreements under the U.S. Constitution; introductory study of humanitarian law; introductory study of the World Bank. Complements but does not repeat material in Law 447. (Examination) (Fall—day, spring—day and evening)

445 **Introduction to International Economic Law** (2) Spanogle
An introductory survey of U.S. trade law, the international trade law system and involved organizations, U.S. trade policy and its formulation, the interaction of domestic political developments on U.S. international trade law and policy and its administration, an introduction to international investment issues, and the international monetary system. Emphasis will be on trade and its interaction with other topics considered. (Examination) (Fall—day)

446 **Legal Aspects of International Business Transactions** (2) Steinhardt, Spanogle
U.S. law and practice relating to the formation and dissolution of international business agreements; brief treatment of other common and civil law systems, multinational codes, and multilateral agreements; U.S. and developing country regulation of foreign investment, concession, licensing, distributorship, and financial agreements; sources of finance; transnational reach of U.S. legislation, including taxation, antitrust, foreign payments, protection of foreign investment, exhaustion of local remedies and espousal, nationalization of investments, sovereign immunity; litigation in a transnational setting, including choice of law and forum, jurisdiction, discovery, enforcement; arbitration. Occasional guest lecturers. Emphasis on current problems. (Examination) (Fall—day and evening)

447 **United Nations Law and World Order** (2) Demas, Alvarez
Introduction to international law through study of law and practice of United Nations Charter, structure and process of decision of United Nations; maintenance of international peace and security—peaceful settlement of disputes and national and collective self-defense; current problems considered by the General Assembly and Security Council and recent decisions of the International Court of Justice. Complements but does not repeat the material in Law 444. (Examination) (Spring—day and evening)

448 **Seminar: International Law** (2)
Survey of arbitration in international commercial, financial, and governmental transactions. Analysis of the arbitration agreement, the process of arbitration, and the enforcement of arbitral awards. Review of the various arbitral tribunals and their rules. (Research Paper)

449 **International Civil Litigation** (3)
The law relevant to the trial of cases having international elements in U.S. courts. Relevance of international issues both to actual litigation and to initial planning of transactions in the light of the client's possible later litigation needs. Acquisition of jurisdiction over foreign defendants, problems and methods of serving process and other judicial documents abroad, effectiveness of choice of forum clauses, procurement of foreign counsel, enforcement of foreign country judgments, taking deposi-

tions and gathering evidence in foreign countries for use in U.S. courts, and selected current problems involving sovereign immunity, act of state, or proof of foreign law. Both U.S. statutes and relevant international conventions are considered. (Examination)

**450 Unfair Trade Practices (3)** Weston, Banzhaf, Schwartz, Schechter

Unfair trade practices at common law and under modern legislation, privileges to markets and compete; interference with contractual relationships; trademarks, trade names; imitation of product appearance; misappropriation of ideas and trade secrets; right of publicity; basic copyright principles; protection of competitors and consumers against false advertising and unfair or deceptive practices under the Federal Trade Commission Act, the Trademark Act, and state unfair trade and consumer protection statutes; price and service discrimination under the Robinson-Patman Act and state legislation. (Examination) (Fall—evening; spring—day)

**452 Federal Antitrust Laws (3)** Weston, Schechter

Federal antitrust law and policy under the Sherman, Clayton, and FTC Acts; basic economic theory of free-market operation; the Rule of Reason and *per se* offenses; price fixing, market division and related agreements under Sherman Act §1; conspiracies; boycotts; trade association activities; measurement of industrial concentration; monopolization and attempts to monopolize under Sherman Act §2; mergers and joint ventures under the Sherman and Clayton Acts; resale price maintenance and other vertical restraints; exclusive dealing and tie-in agreements under the Clayton and Sherman Acts; selected exemptions from antitrust liability. (Examination) (Spring—day and evening)

**454 Product Liability (2)** T. Schwartz

Development of the concept of product liability and consumer's remedies. Special problems and processes in evaluation of risk and benefit encountered in government regulation of dangerous and defective products. Survey of civil actions for harm resulting from defective and dangerous products with reference to parties and proof in negligence, warranty, nuisance, fraud, misrepresentation, and other cases. Problems associated with hazard identification, insurance, and industry self-regulation. Review of Consumer Product Safety Act and current legislation dealing with injuries and remedies in specific areas. (Choice of Research Paper or Examination) (Spring—day)

**460 Problems of the Consumer (arr.)** Rothschild and Staff

(1) *Consumer Protection Center*—Clinical treatment of consumer protection. Students engage in one or more of a number of the Center's projects. For example, "Consumer 9" is a project that solves problems received in writing or by telephone for a nightly television show. "Consumer H-E-L-P" places students in telephone contact with inner-city consumers. The cluster intern program places law students with the District of Columbia Office of Consumer Protection. The Center's federal program allow students to gain experience in regulatory agencies. Students may also write and publish in the *Consumer Protection Reporting Service*. Minimum of eight hours weekly commitment each week; two-hour weekly seminars required in addition for 3 credits. May be repeated once for a total credit not to exceed 6 hours.

(2) *Bankruptcy Clinic*—Open to second- and third-year students. Students participate in negotiations with creditors, counsel clients in financial matters through intensive interviews, and prepare legal petitions in bankruptcy that may be necessary to assist clients. May be taken for 2 or 3 credits. One and one-half hour weekly seminar.

The grade *CR* (Credit) or *NC* (No Credit) is given for both sections of the course. (Fall, spring, and summer—day)

**462 Seminar: Trade Regulation (2)** Weston

Group study of current problems relating to unfair trade practices and federal antitrust laws. (Research Paper)

464 **Patent Law** (2) Bretschneider
Law of patents subsequent to issuance of patent; nature of patent as property and as a legal instrument; validity—novelty, nonobviousness, utility and enablement; infringement, doctrine of equivalents, and file-wrapper estoppel. Designed for students intending to specialize in patent law; knowledge or experience in patent law helpful but not prerequisite. (Examination) (Fall—evening)

466 **Patent Office Practice** (2) Lipsey
Substantive and procedural law of patents leading to issuance of patent, mainly related to proceedings before the U.S. Patent Office. Obtaining and preserving earliest possible patent filing date; continuing applications, res judicata, novelty and nonobviousness requirements; substantive rules of priority of invention and related affidavit practice; nature of claims and formal defects; double patenting. Designed for students intending to specialize in patent law. Prerequisite: Law 464. (Examination) (Spring—evening)

468 **Computers and the Law** (3) Chandler
A critical study of selected major legal problems presented by computer technology, including the impact upon legal doctrine and legal institutions. Jurimetrics, the theory of various uses that are and may be made of computers in legal research, the practice of law, and court administration will be examined. Familiarity with the rudiments of computer science or programming would be helpful, but is not required. (Examination) (Spring—day)

469 **Seminar: Law of Privacy** (2) Park
A review of the law of privacy as it has developed in constitutional litigation, tort law, and state and federal statutes. Current developments and rationales for further expansions of privacy rights are considered (Research Paper)

470 **Medicine for Lawyers** (2)
Survey of the basic medical sciences and the rudiments of clinical medicine as encountered in the practice of law. Medical terminology, the disease process, trauma, and industrial medicine. The application of this fundamental information is demonstrated in personal injury or negligence and malpractice litigation as well as in commitment and equitable proceedings. Emphasis on enabling the lawyer to communicate most effectively with medical specialists. (Examination)

472 **Law and Medicine** (2) Sharpe, Fiscina
Malpractice, insurance, and alternatives to professional liability litigation; securing and presenting medical evidence to prove causation and damages; chemical test data and behavioral science findings in court; entry into and practice of the professions, professional organizations; hospitals; professional service delivery; public policy intervention in medical science—for example, abortion, transplantation, and coerced treatment. (Examination) (Fall—evening)

474 **Seminar: Drugs and the Law** (2) Sirulnik, Meyers
A study of federal and state laws controlling illicit drugs, including the historical evolution of these laws, current offenses and penalties, constitutional limits on the criminal sanction, enforcement practices, and sentencing considerations. Alternative models for controlling drugs, including decriminalization and legalization. Five class sessions will be devoted to mock criminal trials at which student teams conduct direct and cross-examination of guest expert witnesses in the field. Graded on the basis of assigned memoranda pertaining to the legal issues involved in the mock hearings (Writing Assignments) (Spring—day)

475 **Seminar: Law, Science, and Technology** (2) Green
Reciprocal relationships between law and science; absorption of scientific concepts into substantive law through adjudication, legislation, and rule-making techniques and procedures used in handling, developing, and deciding scientific issues. (Research Paper) (Spring—day)

**478 Law and Criminology I: Search for the Causes of Criminal Behavior** (2)
The role that criminological knowledge of crime causation may play in assis... lawyers to appraise the effectiveness of various alternative social and legal devi... controlling deviant behavior. The search for factors related to criminal behavi... be developed historically, with emphasis on current causal theories developed ... various disciplines. Model as well as operational penal codes, sentencing and ... tion practices, and specialized facilities will be analyzed in terms of their relat... to such causal theories. (Research Paper) (Fall—day)

**479 Law and Criminology II: Society's Responses to the Criminal Offender** (2)
Study of the development and current use of society's three major approaches ... handling of offenders: punitive, mechanical, and correctional. Emphasis on societ... changing responses to criminal and delinquent behavior; research findings concer... ing effectiveness of these responses. Analysis of treatment strategies to fa... communication between members of the legal profession and behavior scientis... charged with effectuating these strategies. Prerequisite: Law 478. (Research Paper) (Spring—day)

**480 The Police and the Community** (2)
Problems and potential of contemporary urban law enforcement: the role and ... spective of the police officer; the police *qua* organization; styles of law enforcem... law enforcement in the inner city; relationship with ethnic minorities; civil disord... police–community relations; methods in arrest and investigation; complaint revi... procedures; science and technology in law enforcement; police handling of interp... crime and crime statistics. (Problem Assignments)

**482 Disabled People and the Law** (2)
Examination of those areas in which persons with disabilities have traditionally ... denied some right or benefit afforded other persons in our society and have restr... to legal action; introduction to statutes and agencies designed to protect people w... disabilities. Students may choose to prepare a research paper (and receive ... writing credit and a numerical grade) or to gain practical experience doing a clinic... project (on a *CR/NC* basis). (Spring—day)

**483 National Center for Law and the Deaf Clinical Education Activities** (1, 2, or 3)
Work with the National Center for Law and the Deaf in bringing legal informatio... services, and representation to the more than 13 million Americans who are deaf ... hearing impaired. The Center is designed to help make the hearing-impaired aware o... their legal rights and to assist them in solving their legal and law-related problems. Students may participate in one or more projects: (1) counseling persons with hearing impairments about legal problems at a walk-in clinic usually held on the Gallaudet College campus; (2) preparing and participating in workshops for hearing impaired persons to acquaint them with their rights and obligations under the law; (3) assisting in representing the interests of deaf and hearing-impaired persons in judicial and administrative proceedings; (4) preparing research papers on topics related to the and the deaf or preparing handbooks explaining legal topics to the hearing impaired. Students may learn some sign language but will be assisted by trained translators when dealing with deaf individuals. Approximately 60 hours of work per semester required for each credit hour. Students may repeat this course for a maximum of semester hours of credit. This course may not be taken at the same time as Law 495 any litigating activities in Law 493. The grade of *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer—as arranged)

**484 Women and the Law** (2)
An examination of the treatment of women in all areas of the law and legal remedies for sex discrimination. Emphasis on constitutional law, criminal law, discrimination in the media, education, and employment. Students choose clinical projects or research papers on which to focus the semester's work. Enrollment limited to 30 students. (Research Paper) (Spring—day)

486 **Government Contracts** (3) Nash, Eliasof
Survey of basic law underlying government procurement, basic power and limitations on federal government in entering into contracts, administrative and legislative policies governing these contracts, advertised and negotiated procurement procedures, forms of contracts and clauses used. Law 487 is the substantial equivalent of this course. (Examination and Problem Assignments) (Fall—day)

487 **Government Procurement Law** (4) Cibinic, Lees
Survey of the law pertaining to government procurement, including an analysis of the unique features of government contracting and a discussion of the functions of Congress, the executive branch, and the courts in the procurement process. The course focuses on the contract formation process, including techniques for awarding contracts and litigation and protests involving awards. Law 486 is the substantial equivalent of this course. (Examination and Problem Assignments) (Fall—evening)

488 **Performance of Government Contracts** (4) Nash, Cibinic, Lees
Discussion of the substantive problems that most frequently arise during the performance of government contracts. Interpretation of specifications and the most generally used contract clauses, analysis of the rights of the parties when performance in accordance with the terms of the contract is not obtained. Analysis of the methods that can be used by the parties to a government contract to obtain legal relief, including detailed coverage of the disputes procedure, actions for breach of contract, and forms of equitable and extraordinary relief. Law 489 is the substantial equivalent of this course. (Examination and Problem Assignments) (Spring—evening)

489 **Administration of Government Contracts** (3) Cibinic, Eliasof
Interpretation of contracts and the legal principles governing the risk allocation between the contracting parties. Contractor claims against the government for changes, differing site conditions and delays. Government enforcement of its contract rights for timely performance of work complying with the specifications. Terminations for default and the convenience of the government. Procedures for litigating disputes between the parties. Law 488 is the substantial equivalent of this course. (Examination and Problem Assignments) (Spring—day)

490 **Seminar: Government Contracts** (2) Cibinic, Nash, Lees
Research and discussion of selected problem areas. (Research Paper) (Spring—day)

491 **Government Contracts Cost and Pricing** (2) Cibinic, Nash
Legal aspects of government contract accounting principles and allowability of costs. Cost accounting standards and cost allocation issues. Negotiation of cost, profit, and price. Disclosure of cost accounting data. (Problem assignments) (Fall—day)

492 **Clinical Law Work** (arr.) Staff
Projects involving litigation, research, or public interest activities of a legal nature (including aid to indigents, support of public interest nonprofit corporations, and support of governmental agencies or courts) may be initiated and will be supervised by a faculty member. Projects must be approved in advance by the Law Center Supervisory Committee (three members) both as to whether the project is appropriate and as to the number of semester hours of credit to be granted. A maximum of 10 semester hours of credit may be taken in one or two semesters. This course is open to a limited number of third-year law students. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring)

493 **Legal Aid** (arr.) Sirulnik and Staff
(1) *Civil Administrative Law Clinic*—Working under the supervision of staff attorneys, students represent indigent litigants before state and federal administrative agencies. Activities include Social Security Disability hearings, Rental Accommodations Office hearings, Unemployment and Workers' Compensation hearings, food stamp reviews, will writing, and other public benefits program work. Ten hours work per week required. Two-hour weekly seminar and additional weekly meeting with supervisor. Permission of the instructor required prior to registration. (Del Giudice, Sullivan)
(2) *Immigration Clinic*—Clinical work includes representation of clients at deportation hearings, and oral argument before the Immigration and Naturalization Service.

Board of Immigration Appeals, and the U.S. Court of Appeals. Students wo
aliens residing in the Washington area with a wide variety of problems, i
adjustment from nonimmigrant to immigrant status, obtaining labor certific
work visas, obtaining visas for their relatives in other countries to enter the
States, and obtaining voluntary departure orders for those whose visas have ex
and who are threatened with deportation. Ten hours work per week required
hour weekly seminar and additional weekly meeting with supervisor. Permissi
the instructor required prior to registration. Prerequisite or concurrent registra
Law 360. (Grussendorf)

(3) *Outside Clinical Placement*—Students arrange independent projects with
or federal public interest organizations for academic credit. A compilation of su
gested projects is available within the Community Legal Clinics office. Project
receive prior approval by the Director of Clinical Programs or the staff. (Sum

(4) *Small Business Clinic*—Under guidance of the instructor, students assist sm
businesses and nonprofit organizations, dealing with a wide variety of proble
including drafting partnership and incorporation papers, drafting and review
contracts and commercial leases, advising on tax problems, and resolving dispu
Prerequisite: Law 327 and 420. Permission of the instructor required prior to regi
tion. (Gropper)

The grade *CR* (Credit) or *NC* (No Credit) is given for all sections of
course. (Fall, spring, summer)

Cur

**495 Law Students in Court (4)**

A clinical program in trial advocacy, offering an opportunity to develop skills as a
lawyer while representing indigent persons in the Superior Court of the Distric
Columbia. Students may participate in either the civil division (which focuses prim
ily upon the representation of tenants in landlord–tenant actions, but also han
some consumer, negligence, and other civil matters) or the criminal division
which student litigators defend persons charged with misdemeanor offenses). S
dents in both divisions have the opportunity for jury trials. They are responsible fo
aspects of litigation under the supervision of clinical instructors: interviewing cli
and witnesses, conducting investigations, preparing pleadings, engaging in settl
negotiations or plea bargaining, and conducting all motions hearings and
pursuant to the Superior Court's third-year practice rule. Only third-year students w
have completed Law 218, 215, and 232 may participate in the clinic. Seminars are he
in the civil division on Monday evenings and in the criminal division on Wednesd
evenings. Students must have one day per week available for court appearances
plan to devote approximately 20 hours per week to the clinic. Students must parti
pate in the program for two consecutive semesters, beginning in either the summer
fall. Application must be made during the spring semester of the preceding acade
year. This course may not be taken at the same time as Law 497 or any litigat
activities in Law 493. Enrollment is limited, with selection by lottery. The grade
(Credit) or *NC* (No Credit) is given for this course. (Fall, spring, and summer

Sirulnik and St

**496 Law Students Civil Rights Research Council (LSCRRC) (2, 3, or 4)**

Clinical problems concerned with the legal problems of minorities, women, and
poor. Students work with organizations such as the Lawyers Committee for Civil Ri
Under Law, Women's Legal Defense Fund, Civil Rights Division of the Justice Dep
ment, Institute for the Development of Indian Law, National Committee Agai
Discrimination in Housing, and National Senior Citizens Law Center. Approximat
60 hours of work per semester are required for each credit hour. The grade
(Credit) or *NC* (No Credit) is given for this course. Permission of the instructo
required prior to registration. (Fall, spring, summer)

Sirulnik and St

**497 Clinical Studies in Urban Law (arr.)**

(1) *Civil Litigation Clinic*—Open to third-year students. Students represent indige
litigants in the Small Claims, Family, Landlord–Tenant, and Civil Divisions of the
Superior Court. Work responsibilities include client interviewing, investigation, se

ment negotiations, preparation and argument of motions, as well as conducting actual trials. Two-hour weekly seminar. (Strand, Barthel)

(2) *Federal Appellate Clinic*—Open to third-year students. Students participate in preparing actual cases on appeal, starting with review of trial transcript and culminating with preparation of brief and oral argument before the U.S. Court of Appeals for the District of Columbia Circuit. Appellate practice and procedure studied through texts; consultation with appellate judges, law clerks, and attorneys with cases pending on appeal; observation of arguments in the Supreme Court and the Court of Appeals. Two-hour weekly seminar. (Del Giudice)

(3) *Consumer Litigation Clinic*—Open to third-year students. Students represent indigent consumers in the Small Claims and Civil Divisions of the D.C. Superior Court and U.S. District Court and represent consumers in administrative proceedings before the D.C. Department of Consumer and Regulatory Affairs. Students assume full case responsibility from the initial interview through trial. Two-hour weekly seminar

For all sections, admission is by permission of instructor; students must submit applications during spring term of preceding year. Must be taken for 4 credit hours per term for the entire academic year or for 2 credit hours carried over both summer sessions. (Fall, spring, summer)

498 **Legal Activism (2 or 3)** Banzhaf

Study of the legal process, not to benefit individual clients, but as a powerful tool for affecting social change and advancing the public interest. Topics discussed in a two-hour seminar meeting each week include principles of maximizing legal leverage, legal judo, guerrilla law, working with the press and members of Congress, drafting of legal documents, unusual legal tools and tactics, negotiation, making money from public interest law, etc. Students may choose to bring a public interest legal action before an agency or in court or may undertake another legal action project for 3 credits and receive a numerical grade. Alternatively, students may do research on a topic related to public interest law for 2 credits on a *CR/NC* basis. (Fall—day)

500 **Practical Economics for Lawyers (2)** Rubin

For students with no prior economics training. No calculus or statistics is required. Key principles of economic theory are presented, with focus on the application of these principles to antitrust, regulatory impact analysis (including environmental cost benefit analysis), utility ratemaking and regulation, and deregulation. The course also considers preparation and examination of economic expert witnesses in these areas of the law. (Examination) (Spring—evening)

501 **Public Economic Policy and the Law (2)** Peterson

Interrelation of law and economics in such subject-matter categories and decisional contexts as economic regulation of industry, fiscal policy planning, government research and development practices, foreign trade and investment, and public spending priorities. (Research Paper) (Spring—evening)

502 **Law and Economics (2)** Stout

*(Formerly Economic Planning and the Law)*

Theoretical applications of economic analysis in the study of legal problems and legal institutions. Social welfare theory and basic microeconomic theory are used to explore the common law. For students with no previous economic training. (Examination) (Spring—day)

503 **Statistics and the Law (2)**

Case method approach to using statistical analysis in proving legal issues. Employment discrimination, civil rights, and regulatory law cases are considered. For students who are afraid of numbers. (Examination)

505 **U.S. Regulation of International Trade (2)** Johnston

Study of theory and practical application of United States laws, regulations, and governmental infrastructure affecting international trade. Public international forums and agreements influencing U.S. regulation, e.g., GATT, the MTN, UNCTAD, and treaties of friendship, commerce, and navigation; constitutional basis for U.S. government regulation of international trade, exemplary areas of trade regulation: Export

Administration Act, foreign assets control, tax, Foreign Corrupt Practices Act, A... boycott regulations, antitrust, countervailing duties, import relief for domestic ind... tries, East–West trade, generalized system of preferences, and tariff nomencla... (Examination) (Spring—evening)

**507 Regulation of Investment Advisers and Investment Companies** (2)

Applicability of the Investment Company Act of 1940 to particular business ... that may bring an entity within the statutory definition of investment ... litigation as to fees; policy considerations relating to front-end loads; SEC regu... regarding advertising and promotion; restrictions on activities by affiliates; and ... rent SEC disclosure requirements. Applicability of the Investment Advisers Act of 19... to activities of individuals and entities; procedures for compliance. First Amend... issues raised by SEC enforcement actions; and civil liability under the anti... provisions of the securities laws. (Examination)

**508 Seminar: Health Care Delivery Systems** (2) Tillm...

Study of the role of the lawyer in existing and proposed national systems for delivering... health care. Students will gain familiarity with the concepts and terms in health car... delivery by working with issues in the design, finance, and administration of existi... arrangements; examination of the means of reconciling the expectations of various ... groups of health care service consumers and providers. (Research Paper) (Spring... evening)

**509 Food and Drug Law** (2) Kaplan, Bev...

The Federal Food, Drug, and Cosmetic Act and related laws. Consumer, governmen... and industry viewpoints. (Choice of Research Paper or Examination) (Spring... evening)

**510 Administrative Practices and Procedures (Food and Drug Administration)** (2) Rothsch...

The study of FDA administrative procedures for the purpose of investigating ... significance that administrative practice has on regulatory activity. The course w... consider FDA rulemaking procedures in general, a step-by-step consideration of ... various hearing procedures now available under the new agency practices an... procedures, and problems designed to enable the practical application of rulemaking ... and hearing procedures to achieve resolution. Prerequisite: Law 342 (Examinatio...

**518 Seminar: Comparative Labor Law** (2)

A comparison of different systems for the regulation of labor and industrial relations ... selected countries. Group study of how common problems are handled under these ... systems. Topics may include legal status of collective agreements, worker participati... in decision-making, limits on bargaining weapons, procedures for settlement of ... grievances and jurisdictional disputes, protection against unfair dismissal, and reco... ciliation of individual, minority, and majority group interests. Prerequisite: Law 338 ... equivalent. (Research Paper)

**520 Labor Standards** (2) Ginsburg, Abraham...

Analysis of the Fair Labor Standards Act, its scope and exemptions, debarment and ... suspensions; the laws establishing labor standards for government contracts, includ... ing the Davis–Bacon Act, Walsh–Healey Act, Service Contract Act, and Work Hours Act; ... the role of the Department of Labor, the Comptroller General, and the contracting ... agencies in interpretation, administration, and enforcement of these statutes. (Exam... ination) (Spring—evening)

**521 Labor Relations in the Federal Service** (2) Tobia...

Study of the Civil Service Reform Act, with emphasis on the structure and case law ... developed by the Federal Labor Relations Authority, Federal Service Impasses Pane... and Merit Systems Protection Board. Parallels are drawn between federal sector, ... federal public sector, and private sector decisions. (Research Paper) (Fall—evening)

522 **Internal Union Affairs (2)** Osborne, Witlen
Study of the legal relations between unions and their members with special emphasis on the right to fair representation, the right to union membership, compulsory union membership, the imposition of discipline upon union members, reporting requirements, the conduct of internal union elections, the fiduciary duties of union officers, the imposition of trusteeships, the regulation of racketeering, and political action of unions. Prerequisite: Law 338. (Examination) (Fall—evening)

524 **Equal Employment Opportunity (2)** Morris, Craver
This course covers the spectrum of federal laws and executive orders relating to all types of discrimination in employment, including Title VII of the Civil Rights Act of 1964, as amended by the Equal Employment Opportunity Act of 1972; the Equal Pay Act of 1963, as amended in 1972; the Age Discrimination in Employment Act; the Civil Rights Act of 1866; the Fourteenth Amendment; the National Labor Relations Act, Executive Orders 11246 and 11375 relating to government contractors (including the Philadelphia Plan and other government-imposed affirmative action plans and bid conditions, and Revised Order No. 4 relating to sex discrimination). Substantive and procedural rights available to employees of firms doing business with the government, as well as those of other private firms and state and local government agencies subject to the above federal legislation. (Examination) (Fall—evening; spring—day)

526 **Seminar: Labor Litigation (2)** Driesen
Review and analysis of the Supreme Court's role in the development of national labor policy, broadly conceived. The Court's current employment law docket, including cases arising under the National Labor Relations Act, the Civil Rights Laws, ERISA, and statutes governing the rights of public employees. Brief review of Supreme Court practice and procedure. The role of selected institutions and the proclivities of the Justices in shaping the content and impact of the Court's efforts in the employment arena. Students are expected to prepare a paper and lead a class discussion analyzing the legal and jurisprudential issues presented in a pending Supreme Court case. Prerequisite: Law 338. (Research Paper) (Spring—evening)

527 **Equal Employment Claims and Litigation (2)** Morris
Litigation in federal court of a claim of employment discrimination: problems faced by attorneys for both plaintiff and defendant; practice in drafting pleadings that the attorneys for the parties would prepare in litigating a claim of employment discrimination. (Problem Assignments) (Spring—evening)

529 **Seminar: Public-Sector Labor Law (2)** Craver
Group study of contemporary problems of labor law. The course is devoted exclusively to problems of the public sector. (Research Paper)

532 **The Crime Lab, the Forensic Scientist, and the Criminal Lawyer (2)** Starrs, Melson
Designed to acquaint the student with the operations of a modern crime laboratory and the courtroom acceptability of testimony of forensic scientists and other evidence on laboratory test results. Identification of individuals (fingerprints, palmprints, footprints, voiceprints, anthropological reconstruction, hair identification, and serology), identification of objects (ballistics, handwriting, typewriting, fiber identification, paints, varnishes, glass, wood, and paper), toxicology, pathology, forensic use of the microscope and the camera, the coroner and the medical examiner systems, and drug law enforcement. Visual aids, crime laboratory guest lecturers, and field trips to crime laboratories. (Research Paper or Examination) (Spring—day)

534 **Seminar: Criminal Practice (2)**
Tactical and practical applications of criminal law; mastery of techniques in trying criminal cases. Class sessions built around mock problems based on actual criminal cases; student role-playing as defense attorneys and prosecutors. All phases of criminal trial work are covered—client relations, investigation, discovery, trial preparation; particular emphasis on courtroom techniques—direct and cross-examination, impeachment, refreshing recollection, laying foundations for exhibits, argument, and courtroom demeanor. Though many of the mock problems are written from a defense

viewpoint, techniques taught are relevant to both prosecution and defense ment limited to 15 third-year and graduate students. Prerequisite: Law 305. Stu may elect to receive either a numerical grade or the grade *CR* (Credit) o (No Credit)

**535 Law of Criminal Corrections (2)**
Study of two principal areas: sentencing procedures (including probation, parol imprisonment) and legal rights of prisoners. Enrollment limited to 25 stu (Examination) (Fall, even years—evening)

**538 Law of Real Estate Financing (2)** Carroll, Jo
*(Formerly Banking Institutions and Their Role in Real Estate Investments)*
Types of lenders, choice of entity, construction loans, permanent financing; lend obligations, remedies, and liabilities; title insurance, survey, and liens; ground and commercial lease/leasehold mortgage, joint ventures; alternate capital forma opinion letters. (Examination) (Spring—evening)

**539 Survey of the Secondary Mortgage Market (2)** Fran
*(Formerly Survey of Mortgage Finance)*
Overview of the secondary mortgage market, including mortgage products, finan and operations of government-sponsored agencies, regulatory framework, mortg mathematics and pricing, mortgage-backed securities, and derivatives and the p market. (Examination) (Fall—evening)

**541 Intergovernmental Relations I (2)** Ne
Study of federalism, emphasizing current techniques for achieving cooperation coordination between federal, state, and local governments. Detailed considerati devices used, including interstate compacts, grants-in-aid, and exercise of regula powers. (Research Paper)

**543 Water Resources Law (2)** Reitze, Wi
Federal and state powers over water; riparian and prior appropriation doctr Federal permit programs and wetland protection. The Safe Drinking Water Act an Clean Water Act. Recommended as an introductory course. (Examination) (Fa evening)

**544 Environmental Planning (2)** Ke
Administrative law issues, the National Environmental Policy Act, historic preservati parkland protection, coastal zone management, river basin and floodplain plan comprehensive transportation planning, state environmental planning laws, an tion requirements. (Examination) (Spring—evening)

**546 Natural Resources Law (2)** McBride, Lazar
Introduction to federal public lands and their multiple uses: forestry, grazing, wat mining, fish and wildlife, recreation, and preservation. Principles of Congressional state authority over these lands. Endangered Species Act and wildlife refuges. Wilderness Act and the National Park System. Class focus on topical case studies statutory materials. Recommended as an introductory course. (Research Pa per) (Fall—evening)

**548 Control of Toxic and Hazardous Substances (2)** Friedman, Ber
Analysis of the federal and state laws and regulatory schemes relating to the contro toxic and hazardous substances. The Resource Conservation and Recovery Act and Comprehensive Environmental Response, Compensation, and Liability Act ("Super fund") are examined. (Research Paper) (Spring—evening)

**549 Energy (2)** Holli
Survey of federal regulation of the major energy industries. Emphasis on federa controls affecting the natural gas, coal, oil, synthetic fuel, and electric industries. The course approaches energy regulation from a statutory and case standpoint, and als deals with practical, procedural issues. Enrollment is limited to 35 students. Rec mended for third-year students. (Examination) (Fall—evening)

550 **Use and Control of Nuclear Energy (2)** Malsch
Analysis of the legal framework for regulation of nuclear energy in the United States and for dealing with proliferation of nuclear weapons abroad. Discussion of substantive technical and policy issues relating to nuclear power reactor safety, disposal of radioactive waste, and safeguarding nuclear installations against domestic nuclear terrorism. Focus of the legal discussion is on the U.S. Nuclear Regulatory Commission. Includes such topics as federal preemption, impact of the National Environmental Policy Act of 1969, conduct of adjudicatory hearings under the Administrative Procedure Act, compensation for injuries from nuclear accidents, and prelicensing antitrust reviews. (Research Paper) (Fall—evening)

551 **Comparative Environmental Law (2)** Campbell
Environmental law of the United States, foreign and domestic environmental law of Japan, and international environmental law of the European community. The course considers differences in implementation and enforcement of domestic environmental law under the federal system of government in the United States and the central system of government in Japan as well as differences in implementation and enforcement of domestic and international environmental law. In comparing domestic and international environmental laws, toxic substance and pesticide legislation in the United States, Japan, and the European community is covered. (Research Paper) (Spring—evening)

552 **Patent and Know-how Licensing (2)** Brunsvold
The business and legal criteria necessary to implement and maintain successful licensing programs; emphasis on the strategy and techniques that permit a proprietor of intellectual property to effectively exploit his or her status as the owner of a unique form of property. Subject areas covered are business objectives in licensing; legal outline of licensing situations; rights and duties of license parties; factors in selecting which inventions to license—financial, legal, and commercial; finding and selecting the right licensees; determining and negotiating the terms and clauses of the contract; administering and enforcing the license; antitrust and misuse constraints on the business and law of licensing; tax factors affecting the patent and know-how contract; special problems in trade secret, know-how, and show-how contracts; international licensing. Prerequisite: Law 464. (Choice of Research Paper or Examination) (Spring, odd years—evening)

553 **Chemical Patent Practice (2)** White
Seminar covering patent application preparation, prosecution, appeals, and interferences peculiar to chemical patent practice. Prerequisite: Law 464 and 466, or comparable experience in the practice of patent law. (Examination) (Fall, even years—evening)

554 **Advanced Topics in Patent Law (2)** Bretschneider
Seminar directed to selected, advanced, and usually topical aspects of patent law. Topics may include the Re-examination Statute of 1981, procedure in patent infringement appeals to the U.S. Court of Appeals for the Federal Circuit, patent and copyright protection of living microorganism and genetically engineered sequences, fraud in patent practices, and advanced aspects of practice before the U.S. Patent and Trademark Office, including inter partes interference practice. This course may be repeated for credit. Prerequisite: Law 464 and 466. (Research Paper) (Spring—evening)

555 **Research in Patent, Trademark, and Copyright Law (2)** Bretschneider
Prerequisite: Law 464, 466, and related courses. Request in writing, with proposed outline of topic of research, must be submitted to the instructor at least one month prior to registration day. Work must be completed within the semester and paper submitted not later than the last day of classes. Graduate students may repeat this course once for credit with the approval of the Dean. (Research Paper) (Fall and spring)

558 **International and Comparative Patent Law (2)** Schwaab
Origin of patent laws. Patent systems of major countries—United Kingdom, France, Germany, USSR, and others. Comparative topical survey: kinds of patents, inventors

and applicants, subject matter, novelty, administrative procedures, opposition, revocation, renewal fees, compulsory licensing, infringement, etc. International Convention for the Protection of Industrial Property: origin, membership, organization, substantive provisions. Treaties in the making, Common Market patent system, Patent, Patent Cooperation Treaty. Council of Europe activities. Prerequisite Law 465 and 466. (Examination) (Spring, even years—evening)

**559 Copyright Law (3)** Merrill
Historical background; formalities and essentials in securing a copyright; subject matter of copyright; remedies; international aspects of copyright under Berne Union, Universal Copyright Convention, Inter-American Convention; copyright licensing, performing rights societies. (Examination) (Spring—evening)

**560 U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks (2)** Hefle
Procedural and substantive law on use, registration, and protection of trademarks including detailed registration procedure in the U.S. Patent and Trademark Office, common law rights to marks, and licensing and franchising arrangements. (Examination) (Fall, odd years—evening)

**563 Negotiation: Concepts and Techniques (2)** Ramundo, Tankel, Cra
Roles of the attorney–negotiator and principal (client) in the private, intraorganizational, and international negotiating environments; the "think negotiation" mentality and a suggested conceptualized approach to the negotiation process, including definition of negotiation, four phases of negotiation, and operational checklists; negotiating techniques, including presentational considerations and the use of persuasion, tactics and ploys, and classic do's and don'ts lists, theories of the opening position and concession-making. Practical exercises in the actual conducting of negotiations. Enrollment limited by the instructors. (Writing Assignments) (Spring—day and evening; summer 1988)

**564 Arms Control and Strategic Stability (2)** Doyl
Legal aspects of arms control and strategic stability; nuclear technology, weapons and effects; delivery systems and strategic balance, including linkage to conventional forces; nuclear and arms control strategies; nuclear testing agreements; nonproliferation agreements and issues; SALT I and antiballistic missile agreements; SALT II evolution and issues; verification, compliance, risk reduction, and confidence building; current negotiations and issues (INF, START, ABM, NST, SDI, ASAT) (Research Paper)

**565 The International Law of Human Rights (2)** Fruchterman
Development of the rights of man from Grotius through the American and French Revolutions to the work of the United Nations in the field of human rights, the individual vis-à-vis the state; the regional approach to international protection of human rights, with emphasis on the European Convention; the inter-American, African, and Socialist approaches; human rights in armed conflict; and terrorism as a basic deprivation of human rights. (Research Paper) (Fall—evening)

**566 International Law of Air and Space (2)** Steinhardt
Study of the development of international law related to the use of air space and outer space; analysis of air and space treaties in force; the role of various intergovernmental and nongovernmental international organizations; consideration of special problems such as liability resulting from space activities, space technology and arms control, and pollution and contamination of outer space; earth resources, sensing, etc. Enrollment limited to 25 students. (Research Paper) (Spring—day) Doyle

**567 International Law of the Sea (2)**
International law related to the use of ocean space. Development of international law concerning internal waters, territorial sea, contiguous zone, high seas, continental shelf, fisheries, exclusive economic zone, maritime boundaries, marine environment, marine scientific research, deep seabed, and settlement of disputes. Current legal and policy issues associated with these areas. (Examination) (Spring—evening)

568 **International Humanitarian Law of Coercion Control (2)** Parks
Process of legal decision concerning international conflicts and civil wars, including the protection of war victims, control of international terrorism, problems concerning weapons of mass destruction, war crimes and punishment, and problems of preserving human and material values by transforming coercion situations to minimum order ones. Consideration will be given to the four Geneva Conventions of 1949 for the Protection of War Victims, the Geneva Protocols of 1977, the role of the International Committee of the Red Cross, and current problems in the application of humanitarian law. (Research Paper) (Spring—day)

569 **Soviet Law (2)** Ramundo
Concept of "socialist legality"; legal relationship of individual to state and other participants in Soviet society; role of Party in Soviet legal system; Soviet philosophy of law; state (constitutional) law: Soviet federalism, governmental apparatus, rights and obligations of citizenship; criminal law, property law, labor law, selected topics in civil law and procedure; international law. (Research Paper or Examination) (Fall—evening)

570 **Chinese Law (2)** Hsia
Emphasis on the legal system of China; analysis of the constitutional law of China, including general principles, state structure, and rights and duties of citizens; a brief survey of the administration of justice—courts, procuratorates, and lawyers; marriage law; land law; counter-revolutionary act and other criminal statutes; principles of civil law; Chinese concept of international law. (Research Paper) (Fall—evening)

571 **International Negotiations (2)** McDonald
The art and science of international negotiations from a practitioner's perspective: the Panama Canal Treaties, the Falkland/Malvinas Island negotiations, the problem of Cyprus, negotiating Zimbabwe's independence, U.S. military base negotiations, U.S.–Soviet summitry, global U.N. conference, North–South negotiations, national negotiating styles, two international commercial negotiations, and Track Two (citizen) diplomacy. Prerequisite: Law 444. (Examination) (Spring—day)

572 **Communications Law (2)** Symons
*(Formerly Regulation of Communications Common Carriers)*
Federal regulation of the broadcasting, cable, and telephone industries. Topics include the licensing process; content regulation and political broadcasting rules; structural regulation of the broadcasting industry; cable franchising; rules governing the relationship between the cable and broadcasting industries; FCC and judicial responses to the growth of competition in the telephone industry; and the divestiture of AT&T. (Examination) (Spring—evening)

573 **Accounting Aspects of Federal Income Taxation (2)** Halpern
Problems involved in assigning items of income and deduction to the proper taxable year. General implications of timing differences, annual accounting periods, methods of accounting (particularly the cash method and the accrual method), constructive receipt and the cash equivalency doctrine, transactional problems (including the tax benefit rule and claim of right doctrine), the installment method of reporting gain, cost recovery (including depreciation), and changes in accounting periods and methods. Net operating losses and inventory accounting may also be considered. While this course entails some coverage of widely used accounting methods, it is directed principally at accounting aspects of federal taxation. Students interested primarily in securing a familiarity with financial accounting precepts should instead take Law 324, *Law and Accounting*. Prerequisite: Law 420 or its equivalent. (Examination) (Spring—evening)

577 **Taxation—Special Corporation Problems (2)** Muller
Issues related to restructurings, acquisitions (taxable and tax free), liquidations, contributions to capital, consolidated returns (filing, deferred intercompany transactions, and losses), allocation of income and deductions among related taxpayers, net operating losses, and classification of instruments as debt or equity. Other issues will be considered, based on the current state and application of the federal income tax

laws. Such issues have included the rules regarding the time value of money, sub chapter S corporations and controlled foreign corporations. Prerequisite: Law 42 (Choice of Research Paper or Examination) (Spring—evening)

**578 Taxation—Exempt Organizations (2)** *Hopkins*
Tax-exempt organizations: policy and practice of preferred tax treatment for selected organizations and gifts to them. Statutes, regulations, and IRS practice; legislative origins, judicial interpretations, and policy considerations. Tests of qualification, dis qualification, and limited tax preference. Mechanics of securing and retaining exemption, qualified exemption; unrelated business income; private inurement, political activity Denial or loss of exemption. Return and reporting requirements. Comparative tax treatment of nonexempt and nonprofit organizations. Special sanctions with respect to private foundations, managers, and donors for improper, excessive, or prohibited activities. Enrollment may be limited. Prerequisite: Law 420. (Choice of Research Paper or Examination) (Fall—evening; summer 1988)

**579 Taxation—Real Estate and Income (2)** *Tucker, Gottlieb*
The effect of income taxes on the real estate market and real estate transactions: sales and exchange of real estate interests; various entities for the ownership and development of real estate; the impact of taxes on the landlord and tenant; the impact of taxes on the mortgagor and mortgagee, including the choice of financing techniques, such as sale-leaseback; depreciation, amortization, and obsolescence; basis and basis adjustments, and casualties and other involuntary conversions. Prerequisite: Law 42 Law 424 is suggested but not required. (Examination) (Spring—evening)

**580 Taxation—Oil and Gas (2)**
Application of federal income tax law to producing segment of oil and gas industry Classification of interests; treatment of exploration and development expenditures Depletion allowance and concept of economic interests. Sales vs. leasing transactions Organization problems. Prerequisite: Law 420. (Examination)

**581 Taxation—State and Local (2)** *Swails*
Taxation by state and local governments; problems of real and personal property taxation, sales and use taxes, business and personal income taxes. Limitations on taxation of interstate commerce. Congressional problems. (Choice of Research Paper or Examination) (Fall—evening)

**582 Selected Topics in Taxation—Principles of Charitable Tax Planning (2)** *McCoy*
Intensive study of the federal income, estate, and gift tax consequences of gifts and bequeaths to charity, including limitations and conditions on deductions; uses of charitable trusts; private foundations; estate planning aspects of charitable transfers and special charitable gift planning techniques. (Research Paper or Examination)

**583 Income Taxation of Foreign Business and Investment (2)** *Gourevitch*
The provisions and policies of federal income tax law applicable to foreign income, including considerations affecting the choice of methods of engaging in foreign business and investment, treatment of controlled foreign corporations, allocation of income in foreign commerce, credit for foreign taxes, principles and trends of U.S. tax treaties. (Examination) (Fall—evening)

**584 Income Taxation of Property Transactions (2)** *Levine*
An in-depth study of the federal income tax consequences relating to the sale exchange, or other disposition of property, including stock and securities, real estate, machinery and equipment, commodities, foreign currency, patents and copyrights contracts, goodwill and going-concern value, franchises, and other tangible and intangible property. The continued significance of the distinction between and effect of capital and ordinary gain or loss. Related areas are also examined, including the alternative minimum tax, disallowance of losses, depreciation recapture and methods of deferring recognition of gain and loss. Prerequisite: Law 420. (Examination) (Fall—evening)

585 **Federal Income Taxation of Trusts, Estates, and Beneficiaries** (2)
Rules that allocate items of income and deduction between a trust or estate and its beneficiaries. Computation of distributable net income, the distribution deduction, allocation of deductions between trust and beneficiaries, allocation of expenses to particular classes of income, tier system, treatment of specific bequests, and treatment of capital gains. The treatment of certain trusts as owned by the grantor or beneficiary and the special rules taxing certain gains of a trust at the grantor's rate; rules that determine whether a trust will be taxed under the general scheme for taxing trusts or whether it will be treated as owned by the grantor. (Examination)

586 **Taxation—Deferred Compensation I** (2) Lieber, Holland
Tax and labor law consequences of deferred compensation. Examination of new standards imposed by the Employee Retirement Security Act of 1974. Consideration of tax consequences of "unqualified" plans, lump sum distributions, individual retirement accounts, and the requirement that defined benefit plans be insured by the Pension Benefit Guaranty Corporation. Prerequisite: Law 420. (Problem Assignments and Examination) (Fall—evening)

587 **Taxation—Deferred Compensation II** (2) Lieber, Klevan, Holland
Nonqualified arrangements: constructive receipt, cash equivalent, I.R.C. §§ 83 and 404, and individual retirement accounts. Qualified plans: deductions, distributions (annuities, lump-sum distributions, rollovers, employer stock), ESOPs, termination insurance, fiduciaries and service providers (reporting, disclosure, fiduciary standards, self-dealing), estate and gift tax, unrelated business income, simplified pension plans, and master and prototype plans. Law 420 recommended but not required prior to taking this course. Neither a tax background nor Law 586 is prerequisite. (Examination) (Spring—evening)

588 **Seminar: Tax Practice and Procedure** (2) Smiley, Lauber
Review of the major areas of tax practice, including organization of the Internal Revenue Service, legislation, administrative regulations, tax planning, tax rulings, tax audit, settlement procedures, claims for refund, tax collection processes, criminal tax practice, and ethical problems in tax practice. Preparation of various documents is required. Prerequisite: 5 semester hours of taxation courses, including Law 420. (Problem Assignments) (Fall—evening)

591 **Legislative Drafting** (2) Woodman, Smith, Burk, Bergman
Advanced instruction and practice in legislative drafting; overview of legislative process with emphasis on legislative drafting. Enrollment limited to 30 students. (Problem Assignments) (Fall and spring—evening)

596 **Graduate Clinical Studies** (1, 2, 3, or 4) Staff
Limited to LL.M. candidates. Practical experience in the student's area of specialization or interest. The student may work with a government agency, Congressional committee, court, or other such entity performing tasks normally assigned to an attorney. Course approval must be obtained from the student's faculty adviser and/or the Dean. A maximum of 4 credit hours may be applied toward graduation. For each credit hour, 56 hours of nonremunerated work must be performed. A written report describing in some detail the specific work performed and evaluating the experience received is required. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer)

597 **Independent Studies** (arr.) Staff
Limited to teaching fellows. The proposed program of study must be submitted to a faculty member in writing and approved prior to the beginning of the semester. May not be elected for more than 12 semester hours of credit. (Fall and spring)

598 **Research in Public Law** (1 or 2) Staff
Limited to graduate students with at least a *B* average who have had a seminar or comparable course in the field of proposed research. Students are responsible for obtaining an adviser from the full-time faculty who is willing to sponsor their research. This adviser's name must be submitted to the Dean at registration. Work must be completed within the semester. Students may repeat this course once for credit with the approval of the Dean. (Research Paper) (Fall, spring, summer)

**599–600 Thesis (2–2)**
Students must register for two successive semesters and cannot register for both sections in one semester. (Fall, spring, summer)

**620–21 Legal Research and Writing (1–1)** Metz
**(For Foreign Students)**
Introduction to and practical experience in the use of a law library; instruction and practice in legal writing, including a memorandum and appellate court brief; instruction and experience in the preparation and argument of an appellate court case; instruction in questions of professional responsibility and ethics. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. For credit, a student must attain a minimum grade of 65. No credit will be given for this course unless it is taken both fall and spring semesters. Failure to complete the work in this course will result in a grade of 45. (Fall and spring—evening)

# SPECIAL PROGRAMS IN RESEARCH AND INSTRUCTION

## ADMINISTRATIVE LAW: ECONOMIC REGULATION

*Faculty Advisers* R.E. Park, G.E. Weston

344 *Administrative Law Seminar*
502 *Economic Planning and the Law*
510 *Administrative Practices and Procedures (Food and Drug Administration)*
509 *Food and Drug Law*
500 *Practical Economics for Lawyers*
501 *Public Economic Policy and the Law*
352 *Public Policy and Mass Media*
345 *Regulated Industries*
325 *Regulation of Securities Markets*
326 *Securities Regulation*
327 *Securities Aspects of Corporate Finance*
508 *Seminar: Health Care Delivery Systems*
462 *Seminar: Trade Regulation*
505 *U.S. Regulation of International Trade*

Master of Laws candidates in the area of Administrative Law: Economic Regulation who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

342 *Administrative Law*
452 *Federal Antitrust Laws*
450 *Unfair Trade Practices*

**Other Related Courses**

541 *Intergovernmental Relations I*
402 *Planning, Zoning, and Land Use Law*

550 *Use and Control of Nuclear Energy*
559 *Copyright Law*

## CORPORATION LAW

*Faculty Advisers* L.D. Solomon, H.P Green

334 *Business Planning*
445 *Introduction to International Economic Law*
446 *Legal Aspects of International Business Transactions*
507 *Regulation of Investment Advisers and Investment Companies*
538 *Law of Real Estate Financing*
327 *Securities Aspects of Corporate Finance*
505 *U.S. Regulation of International Trade*

Master of Laws candidates in the area of Corporation Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

325 *Corporations*
452 *Federal Antitrust Laws*
370 *Sales and Sales Financing*
426 *Taxation—Partnerships and Subchapter S*
424 *Taxation—Federal Income, Corporations and Shareholders*
450 *Unfair Trade Practices*

### Other Related Courses

487 *Government Procurement Law*
583 *Income Taxation of Foreign Business and Investment*
454 *Product Liability*
561 *Public Economic Policy and the Law*
526 *Securities Regulation*
462 *Seminar: Trade Regulation*
577 *Taxation—Special Corporation Problems*
560 *U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks*

## ENVIRONMENTAL LAW PROGRAM

*Director* A.W. Reitze, Jr.

The Environmental Law Program consists of course work, individual research, and clinical work, with the student selecting the mix that meets his or her particular need. Most courses are offered in the early evening so that they can be taken by students in both the day and evening divisions. Advanced courses are taught by some of the most experienced practitioners in the field.

The clinical program allows students to work for the government or for environmental lawyers in the private sector. Placements are usually available with the Departments of Justice, Energy, and Transportation, the Environmental Protection Agency, and private organizations such as the Environmental Defense Fund, the Natural Resources Defense Council, and the National Wildlife Association. The clinical program offers the student with very specific environmental interests a chance to develop these interests in a work setting. Thus, students with interests in topics such as wetland acquisition, historical protection, or wildlife protection can take relevant course work and then further specialize through the clinical program.

If the student is interested in individual research, course credit is also available for this type of study.

414 *Clinical Studies in Environmental Law*
548 *Control of Toxic and Hazardous Substances*
410 *Environmental Law I*
411 *Environmental Law II*
544 *Environmental Planning*
546 *Natural Resources Law*
547 *Pollution Control Law*
550 *Use and Control of Nuclear Energy*
551 *Comparative Environmental Law*
543 *Water Resources Law*
557 *Comparative Environmental Litigation*

**Individual Research**

314 *Legal Writing (J.D. Candidates)*
598 *Research in Public Law (Master's Candidates)*
599–600 *Thesis*

**Other Related Courses**

342 *Administrative Law*
344 *Administrative Law Seminar*
386 *Admiralty*
509 *Food and Drug Law*
487 *Government Procurement Law*
566 *International Law of Air and Space*
567 *International Law of the Sea*
591 *Legislative Drafting*
398 *Modern Real Estate Transactions*
500 *Practical Economics for Lawyers*
415 *Occupational Safety and Health Legislation*
501 *Public Economic Policy and the Law*
345 *Regulated Industries*
508 *Seminar: Health Care Delivery Systems*
580 *Taxation: Oil and Gas*
581 *Taxation: State and Local*

## GOVERNMENT CONTRACTS PROGRAM

*Director* F.J. Lees
*Faculty Advisers* R.C. Nash, Jr., John Cibinic, Jr.

A comprehensive government contracts program provides continuing instruction for industry and government personnel in this field and a program of courses leading to the Master of Laws degree in Government Procurement Law. The program includes (1) short seminars, (2) one-week courses in advanced problems in the field, (3) an annual institute treating a problem of contemporary importance, (4) an annual conference in a major area, (5) compilation of materials for use in current courses, (6) publication of a series of monographs treating special problems in the field, and (7) special research projects.

486 *Government Contracts*
487 *Government Procurement Law*

489 *Administration of Government Contracts*
491 *Government Contracts Cost and Pricing*
541 *Intergovernmental Relations I*
490 *Seminar: Government Contracts*

Other Related Courses

334 *Business Planning*
340 *Collective Bargaining and Labor Arbitration*
468 *Computers and the Law*
410 *Environmental Law I*
527 *Equal Employment Claims and Litigation*
524 *Equal Employment Opportunity*
452 *Federal Antitrust Laws*
300 *Federal Jurisdiction*
338 *Labor Law*
520 *Labor Standards*
446 *Legal Aspects of International Business Transactions*
591 *Legislative Drafting*
563 *Negotiation: Concepts and Techniques*
464 *Patent Law*
424 *Taxation—Federal Income, Corporations and Shareholders*
450 *Unfair Trade Practices*
550 *Use and Control of Nuclear Energy*

## INTERNATIONAL AND COMPARATIVE LAW PROGRAM

*Acting Director* R.G. Steinhardt

The objectives of the International and Comparative Law Program are to provide insights, skills, and substantive understanding of international law and foreign legal systems. Specific objectives in international law are to provide an understanding of decision making, sanction processes, legal institutions, and the relationships between domestic and international law. Specific objectives in comparative law include understanding of the basic institutions of civil law countries, the reception of civil law and common law in non-Western countries, and the role of decisional law and judicial review in selected legal systems. Improvements that are needed to promote the rule of law in the world community are also considered. International aspects of business transactions and economic development are included in the program. The specializations in public law include the humanitarian law that seeks to protect war victims in conflict situations and disaster victims in peace time and promotion of the control of violence when it cannot be eliminated. The objectives of the program are implemented through course work and seminars for both J.D. and post-J.D. degree students and through research and writing in pertinent fields.

The basic courses for the International and Comparative Law Program are Law 444, *International Law and World Order*, and Law 447, *United Nations Law and World Order*. Either of these courses provides an important background for the following advanced seminars. Law 438, *Comparative Law*, is also recommended for background.

570 *Chinese Law*
564 *Diplomatic and Consular Law and Practice*
568 *International Humanitarian Law of Coercion Control*
566 *International Law of Air and Space*
565 *International Law of Human Rights*

567 *International Law of the Sea*
571 *International Negotiations*
569 *Soviet Law*
443 *U.S. Foreign Relations Law*
505 *U.S. Regulation of International Trade*

Master of Laws candidates in the area of International and Comparative Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

386 *Admiralty*
438 *Comparative Law*
440 *Conflicts of Laws*
444 *International Law and World Order*
447 *United Nations Law and World Order*

**Other Related Courses**

518 *Comparative Labor Law Seminar*
360 *Immigration Law*
583 *Income Taxation of Foreign Business and Investment*
446 *Legal Aspects of International Business Transactions*
550 *Use and Control of Nuclear Energy*

## LABOR AND EMPLOYMENT LAW

*Faculty Advisers* D.P. Rothschild, C.B. Craver

527 *Equal Employment Claims and Litigation*
524 *Equal Employment Opportunity*
522 *Internal Union Affairs*
521 *Labor Relations in the Federal Service*
520 *Labor Standards*
415 *Occupational Safety and Health Legislation (OSHA)*
518 *Seminar: Comparative Labor Law*
341 *Seminar: Labor Law*
526 *Seminar: Labor Litigation*
529 *Seminar: Public-Sector Labor Law*

Master of Laws candidates in the area of Labor Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

340 *Collective Bargaining and Labor Arbitration*
338 *Labor Law*

**Other Related Courses**

460 *Problems of the Consumer*
587 *Taxation—Deferred Compensation II*

## LAND USE MANAGEMENT AND CONTROL PROGRAM

*Director* J.M. Brown
*Faculty Advisers* J.M. Brown, L.A. Schiller, J.P. Chandler

The social, economic, technological, political, and legal interrelationships generated by the fact that land is a basic, limited-supply natural resource, capable of being subjected to differing but concurrent public and private uses, raise a growing

number of issues involving management policy and control measures that are of critical concern to the future of the nation. The Land Use Management and Control Program, through a combination of academic, clinical, and game-simulation processes, seeks to provide an understanding of existing and pending problems, needs, means, and opportunities for solution with respect to this developing area of national concern.

402 *Planning, Zoning, and Land Use Law*
403 *Seminar: Current Problems in Land Use Management and Controls*
404 *Land Use Administrative Process*
408 *Land Development Law*
409 *Local Government Law*
411 *Environmental Law I*
538 *Law of Real Estate Financing*
539 *Survey of the Secondary Mortgage Market*
541 *Intergovernmental Relations I*
543 *Water Resources Law*
546 *Natural Resources Law*
579 *Taxation—Real Estate and Income*
581 *Taxation—State and Local*

Master of Laws candidates in the area of Land Use Management and Control who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

342 *Administrative Law*
398 *Modern Real Estate Transactions*

**Other Related Courses**

322 *Agency and Partnerships*
325 *Corporations*
326 *Securities Regulation*
344 *Administrative Law Seminar*
345 *Regulated Industries*
362 *Legislation*
380 *Remedies*
382 *Insurance*
394 *Community Property/Marital Property*
411 *Environmental Law II*
414 *Clinical Studies in Environmental Law*
442 *Jurisprudence*
482 *Disabled People and the Law*
487 *Government Procurement Law*
500 *Practical Economics for Lawyers*
501 *Public Economic Policy and the Law*
544 *Environmental Planning*
545 *Environmental Litigation*
548 *Control of Toxic and Hazardous Substances*
550 *Use and Control of Nuclear Energy*
564 *Negotiation: Concepts and Techniques*
580 *Taxation—Oil and Gas*
591 *Legislative Drafting*
596 *Graduate Clinical Studies*

## PATENT AND INTELLECTUAL PROPERTY LAW PROGRAM

*Acting Director* B. Bretschneider
*Faculty Advisers* G.E. Weston, B. Bretschneider

The Patent and Intellectual Property Law Program is designed for students in the J.D. and post-J.D. degree programs whose intentions are to specialize in the practice of patent, copyright, or trademark law. An organized program has been developed to offer as complete and as integrated a collection of courses in these fields of law as possible. The program's course offerings now total 19 semester hours (12 of which are in patent law), one of the most extensive in the United States. (See the Patent and Trade Regulation Law area of specialization in the Advanced Courses section of this Bulletin.) The object of the Patent and Intellectual Property Law Program is to provide the student with a concentration in this field of law at a level of specialization and maturity that can enable advancement far more rapidly than usual in this field.

554 *Advanced Topics in Patent Law*
553 *Chemical Patent Practice*
559 *Copyright Law*
558 *International and Comparative Patent Law*
552 *Patent and Know-how Licensing*
560 *U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks*

Master of Laws candidates in the area of Patent and Trade Regulation Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

452 *Federal Antitrust Laws*
464 *Patent Law*
466 *Patent Office Practice*
450 *Unfair Trade Practices*

### Other Related Courses

468 *Computers and the Law*
487 *Government Procurement Law*
469 *Seminar: Law of Privacy*
462 *Seminar: Trade Regulation*

## TAXATION

*Faculty Advisers* L.D. Solomon, T.S. Sims

422 *Taxation—Federal Estate and Gift*
573 *Accounting Aspects of Federal Income Taxation*
583 *Income Taxation of Foreign Business and Investment*
582 *Selected Topics in Taxation—Principles of Charitable Tax Planning*
395 *Seminar: Estate Planning*
428 *Seminar: Special Problems of Tax Policy*
588 *Seminar: Tax Practice and Procedure*
584 *Income Taxation of Property Transactions*
585 *Federal Income Taxation of Trusts, Estates, and Beneficiaries*
586 *Taxation—Deferred Compensation I*
587 *Taxation—Deferred Compensation II*
578 *Taxation—Exempt Organizations*
580 *Taxation—Oil and Gas*

426 *Taxation—Partnerships and Subchapter S*
579 *Taxation—Real Estate and Income*
577 *Taxation—Special Corporation Problems*
581 *Taxation—State and Local*

Master of Laws candidates in the area of Taxation who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

324 *Law and Accounting*
420 *Taxation—Federal Income*
424 *Taxation—Federal Income, Corporations and Shareholders*

**Other Related Courses**

334 *Business Planning*
446 *Legal Aspects of International Business Transactions*
326 *Securities Regulation*

## GENERAL ALUMNI ASSOCIATION

*President* John R. Manning

The objectives of this association are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Eligible members are those who have enrolled in any school of the University and who have left the University in good standing, or any person who is or has been a member of the teaching, research, or administrative staff of the University, or of the Board of Trustees of the University.

The affairs of the Association are directed by a Governing Board, the majority of whose members represent the constituent alumni organizations of the University's schools and college.

The voluntary leadership of the Association works closely with the staff of the Alumni Relations Office in carrying out Association affairs. The Association may be contacted through the Alumni Relations Office.

## THE GEORGE WASHINGTON LAW ALUMNI ASSOCIATION

The George Washington Law Alumni Association was founded in 1912 and has been affiliated with the General Alumni Association since 1926. Its purposes as stated in the constitution are to promote high standards of legal education, to keep the alumni of the school in close touch with each other, and to further the interest of the school. Eligible members are those who have matriculated at the school or National University and have left in good standing, and any member or former member of the faculty of the school. Active members are those eligible members who are current contributors to the Law Annual Support Program of the University and life members of the George Washington Law Alumni Association. The Association periodically publishes the Law Alumni Directory. Law alumni are urged to keep the Alumni Office informed of their whereabouts so that directory information can be kept to date. The Law Alumni Office is in the Jacob Burns Law Library, 716 Twentieth Street, N.W., Washington, D.C. 20052.

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President, Student Bar Association, National Law Center

# THE UNIVERSITY

## HISTORY AND ORGANIZATION

The George Washington University had its beginning in 1821 as the Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a National University in the Federal City. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter, which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character, it provided "that persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half century the University's present plant has been developed in that section of the old First Ward familiarly known as Foggy Bottom, between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area contains several reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for 50 years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he had hoped to see established.

The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center, the Elliott School of International Affairs, and the Schools of Medicine and Health Sciences, Engineering

and Applied Science, Education and Human Development, and Government and Business Administration; and the Division of Continuing Education.

The George Washington University is privately endowed and is governed by a self-perpetuating Board of Trustees of which the president is an *ex officio* member.

## ACADEMIC STATUS

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Schools. The University is on the approved list of the American Association of University Women and is a member of the College Board.

## LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the Corcoran Gallery of Art, the Department of State, the Department of the Interior, the General Services Administration, the National Academy of Sciences, and the Kennedy Center for the Performing Arts.

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## SUMMARY OF REGISTRATION, FALL SEMESTER 1987

| | *1st year* | *2nd year* | *3rd year* | *4th year* | *Graduate* | *Other* |
|---|---|---|---|---|---|---|
| **Day** | 356 | 369 | 379 | | 97 | 14 |
| **Evening** | 66 | 71 | 68 | 73 | 133 | |

**Total: 1,626**

*On sabbatical leave fall semester 1988; on leave of absence spring semester 1989

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*Columbian College of Arts and Sciences:* Associate in Arts (A.A.), Bachelor of Arts (B.A.), Bachelor of Music (B.Mus.), and Bachelor of Science (B.S.)

*Graduate School of Arts and Sciences:* Master of Arts (M.A.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (M.Mus.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Philosophy (M.Phil.), and Doctor of Philosophy (Ph.D.)

*School of Medicine and Health Sciences:* Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), Master of Public Health (M.P.H.), and Doctor of Medicine (M.D.)

*National Law Center:* Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L.[Am.Prac.]), and Doctor of Juridical Science (S.J.D.)

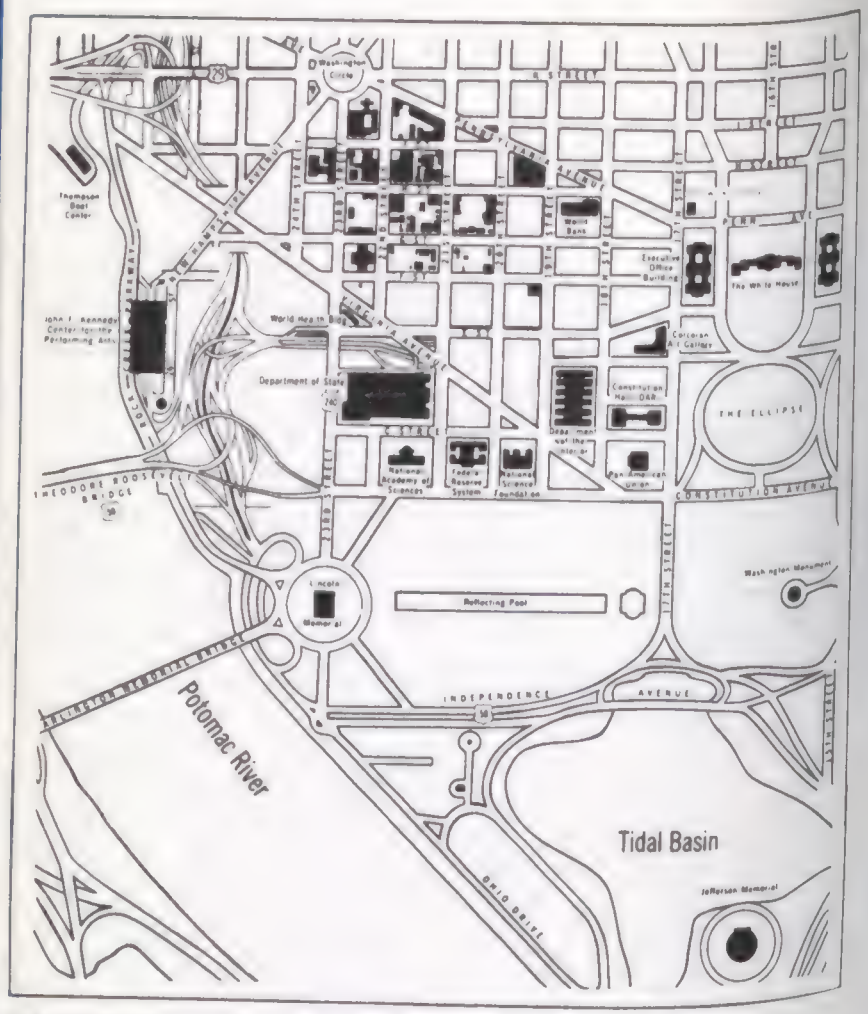
*School of Engineering and Applied Science:* Bachelor of Science (Civil Engineering) (B.S.[C.E.]), Bachelor of Science (Computer Science) (B.S.[C.S.]), Bachelor of Science (Electrical Engineering) (B.S.[E.E.]), Bachelor of Science (Mechanical Engineering) (B.S.[M.E.]), Bachelor of Science (Systems Analysis and Engineering) (B.S.[S.A.&E.]), Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Engineer (Engr.), Applied Scientist (App.Sc.), and Doctor of Science (D.Sc.)

*School of Education and Human Development:* Bachelor of Arts in Education and Human Development (B.A. in Ed.&H.D.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education and Human Development (M.A. in Ed.&H.D.), Master of Arts in Teaching (M.A.T.), Master of Education (M.Ed.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

*School of Government and Business Administration:* Bachelor of Accountancy (B.Acct.), Bachelor of Business Administration (B.B.A.), Master of Accountancy (M.Acct.), Master of Association Management (M.A.M.), Master of Business Administration (M.B.A.), Master of Health Services Administration (M.H.S.A.), Master of Public Administration (M.P.A.), Master of Science in Information Systems Technology (M.S. in I.S.T.), Master of Taxation (M.T.), Master of Urban and Regional Planning (M.U.&R.P.), Specialist in Health Services Administration (Spec. in H.S.A.), and Doctor of Philosophy (Ph.D.)

*Elliott School of International Affairs:* Bachelor of Arts (B.A.) and Master of Arts (M.A.)


GW
The George Washington University Bulletin
School of Engineering and Applied Science
1988–1989




THE GEORGE WASHINGTON UNIVERSITY CAMPUS/WASHINGTON, D.C.

THE GEORGE WASHINGTON UNIVERSITY BULLETIN
(USPS 343-070)
*Volume 87, Number 3, July 1988*

*The George Washington University Bulletin (USPS 343-070) is published at Washington, D.C. 20052.*

*Four times per year. Two issues in April and one each in July and November*

*Second Class Postage Paid at Washington, D.C.*

*POSTMASTER: Please send changes of address to The George Washington University Bulletin, c/o Mail Service, 2025 F Street, N.W., Washington, D.C. 20052*

THE GEORGE WASHINGTON
UNIVERSITY BULLETIN

# THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE 1988–1989

WASHINGTON, D.C. 20052
(202)994-6158
(800)537-7327

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# Calendar 1988–1989*

## 1988 Fall Semester

| | |
|---|---|
| *August 23–24* | Orientation for students from foreign countries |
| *August 25–26* | Orientation and placement tests for new students |
| †*August 29–31* | Registration—Tompkins Hall of Engineering |
| *September 1* | Classes begin |
| *September 5* | Labor Day (holiday) |
| *September 9* | Fall Convocation |
| *October 1* | Applications for February graduation due |
| *November 1* | Applications for spring semester financial aid due |
| *November 24–25* | Thanksgiving holiday |
| *November 28* | D.Sc. dissertations due from February candidates |
| *December 8* | Last day of fall semester classes |
| *December 12–20* | Examination period |

## 1989 Spring Semester

| | |
|---|---|
| *January 3* | Orientation for new students and students from foreign countries<br>Master's theses due from February candidates |
| †*January 4–6* | Registration—Tompkins Hall of Engineering |
| *January 9* | Spring semester classes begin |
| *January 16* | Martin Luther King Day (holiday) |
| *February 1* | Applications for May graduation due |
| *February 19* | Winter Convocation |
| *February 20* | George Washington's birthday observed (holiday) |
| *February 24* | D.Sc. dissertations due from May candidates |
| *March 1* | Deadline for submission of 1989–90 undergraduate financial aid applications |
| *March 13–17* | Spring recess |
| *April 1* | Deadline for submission of summer sessions and 1989–90 graduate financial aid applications |
| *April 10* | Master's theses due from May candidates |
| *April 24* | Last day of spring semester classes |
| *April 28–May 6* | Examination period |
| *May 7* | Commencement |

*The academic calendar is subject to change.
†The registration procedure and hours of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

## 1988

### July

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## 1989

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## To All Prospective Students:

The School of Engineering and Applied Science has been in continuous session since 1884 and offers programs of study leading to bachelor's, master's, professional, and doctoral degrees. Its primary objective is to help the student develop a well-trained mind by providing optimal educational opportunities for achieving and maintaining professional competence. This includes the development of flexibility for continuing competence; the School's programs are designed to promote successful adaptation to rapidly changing technology in future careers.

This Bulletin describes the programs and requirements for undergraduate and graduate study in the School of Engineering and Applied Science and includes information on the Engineering Honor Scholarships, Cooperative Education Program in Engineering, and educational and research opportunities offered by the Joint Institute for Advancement of Flight Sciences (JIAFS), several other specialized research institutes, and the Industrial Liaison Program.

Engineering Honor Scholarships and Fellowships have been established to recognize academically talented students who wish to study at the School of Engineering and Applied Science. The scholarships are awarded on the basis of academic merit only, and financial need is not a requirement for consideration.

The Cooperative Education Program in Engineering provides the undergraduate engineering student the opportunity to obtain an enduring foundation in engineering education by combining academic learning with practical, first-hand experience in the student's chosen field of engineering. The student's earnings may help pay for part of the cost of an engineering education.

JIAFS was created by the joint efforts of the NASA–Langley Research Center and the School of Engineering and Applied Science. The education and research opportunities offered in the program combine the academic resources of George Washington University and the professional research resources and facilities of NASA–Langley Research Center to prepare qualified graduate students for careers in research, development, design, and teaching in the flight sciences.

The School of Engineering and Applied Science is a professional school in a university comprising eight degree-granting schools and colleges. The environment of the nation's capital is very favorable for the intellectual and cultural development of the student. The Washington metropolitan area contains the second largest concentration of research and development in the United States, and the engineering component of this activity is similarly extensive, offering many employment opportunities to students before and after graduation.

The atmosphere of the School is one of serious-minded effort toward mature academic development. Being a small school, it recognizes the individual as the single most important element in the educational process. The student body, undergraduate and graduate, has a primary interest in design, research, development, and management in both scientific and engineering activities. Alumni of the School are engaged in all fields of engineering—in science, management, government, and education.

The philosophy of the School, which might be summarized as "education for creativity, not conformity," has through the years reflected the many subtle and profound changes in engineering education and the engineering profession.

The faculty of the School and I look forward to a mutually challenging relationship with you. If you wish additional information, please do not hesitate to call upon the department chairmen or me.

Harold Liebowitz
Dean



## The Study of Engineering

The engineering profession extends into many areas of industry, research, commerce, and the arts. Engineers address problems in the manufacturing sector, such as the design of mechanical, electrical, and chemical processes, equipment, and plants; in the design and construction of structures such as bridges, tunnels, harbors, and dams; in aircraft design and construction, including electronic equipment for control, guidance, and communication; in the operation of transportation systems; in the automotive industry; in the missile and space programs; in energy resources and power and in the generation and transmission of power; in modern communication; in traffic control; in city planning; in public health and sanitation as it affects the environment; and in ventilation and refrigeration. This list is far from exhaustive, but it demonstrates the diversity of the profession and the many opportunities to specialize.

### The Relationship of Engineering and Science

In any discussion of engineering and applied science, it is important to emphasize the distinction between engineering and science. A President's Scientific Advisory Committee has pointed out that the engineer and scientist each play an important role on a team: "The scientist is one who seeks to extend the boundaries of knowledge in [a] chosen field. The engineer has the task of combining the knowledge of science with a knowledge and awareness of the needs and limitations of human beings and of a human society to develop and create things for human use. . . . While scientists have uncovered the basic knowledge, it is the engineers who have created the tangible tools, materials, and products that have revolutionized our daily lives, our community living, and our national defense."

The work of engineers is a focal point at which scientific knowledge, the use of such knowledge to serve society, financial considerations, human resources, and society's needs intersect. The engineer is concerned, therefore, with the means for operating a dynamic society and must consider not only whether sufficient knowledge exists to create a product but also how the product can be built, who will use it, and how its use will affect the environment in which it will operate.

## The Professional Engineer

Engineers are concerned with the quality and preservation of human life. The engineer makes use of the advances of science and technology in an economically feasible manner for the benefit of society. This process is complex and challenging. Although the content of engineering curricula is certainly scientific, the engineer has not lost a sense of being an intellectual agent in the practical world. This responsibility of the engineer arises from the broad implications of engineering for the whole of society as well as from the stringent requirements for competence. Technology has radically rearranged human life in our time. There are many who believe that even though the threshold of space has been crossed, the union of medical and engineering practice has been achieved, and breakthroughs in other areas have been made, this impact of engineering on modern life is just a preview of the engineering of tomorrow.

## Engineering Education

A rapidly changing profession requires education for the future based on fundamental principles of science applicable to a dynamic, advanced society. In the fields of engineering and applied science, there is no substitute for demonstrated competence; without question, achievement in particular courses of study is important. Equally important, however, is the ability to analyze all aspects of a problem, to formulate solutions, and to evaluate those solutions in light of all available information. To assure that students' undergraduate education will enable them to meet these important goals, the faculty of the School of Engineering and Applied Science periodically evaluates the undergraduate program.

The curricula of the School of Engineering and Applied Science are designed to assist students in preparing for careers in engineering and applied science. This requires that students master the principles on which future practice will be based. An education centered on the junction between theory and practice enables the engineer to follow the many interests and opportunities that may develop.

It should not be assumed, however, that only the intellectual elite should consider the study of engineering and applied science. Engineering, like medicine, law, education, and other disciplines, requires scholars. But in any of these areas, the student who has not achieved high scholastic standing can find a place if he or she has genuine interest and is willing to work. It is difficult to generalize, but students who have demonstrated an aptitude for mathematics, science, and English will probably find the work of engineers and the study of engineering and applied science satisfying and challenging. Intellectual curiosity and the desire to learn and to work hard can be good indicators of success. No school or college can *give* an education. It can offer only the opportunity to learn.

# THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE

## History

The School of Engineering and Applied Science was organized October 1, 1884, as the Corcoran Scientific School of Columbian University. The School was named in honor of William W. Corcoran, president of the Corporation and the Board of Trustees of the University from 1869 to 1888. Day and evening courses were offered in literature, science, and technology and led to the degrees of Bachelor of Science, Civil Engineer, Mechanical Engineer, and Mining Engineer. The School was among the first to accept women for degree candidacy in engineering.

In 1903 the Corcoran Scientific School, the School of Graduate Studies, and the Columbian College were merged into a single Department of Arts and Sciences. Graduate engineering degrees were offered.

Administrative changes led to the creation of the Washington College of Engineering in 1905 as one of several semi-independent undergraduate colleges of the University, each with its own Board of Trustees. The College provided instruction leading to degrees in engineering and architecture.

In 1909 the name was changed to the College of Engineering and Mechanic Arts, and the curricula were revised to give students a thorough understanding of the theory underlying engineering practice. Emphasis was placed on the development of a knowledge of scientific principles upon which students could build and by which they might solve new problems met in practice.

The name of the school was changed again in 1914 to the College of Engineering and later to the School of Engineering. Architecture was dropped from the curriculum, and degrees were limited to the field of engineering. However, the primary emphasis on principles rather than technology, which had characterized the program since 1903, was continued and has remained a distinguishing feature of the School.

The name School of Engineering and Applied Science was adopted in 1962.

## Academic Status

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Schools.

The University is on the approved list of the American Association of University Women and is a member of the College Board.

All undergraduate engineering curricula in the School of Engineering and Applied Science, including the computer engineering option within the electrical engineering curriculum, are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. The undergraduate computer science curriculum is accredited by the Computer Science Accreditation Commission of the Computing Sciences Accreditation Board.

## University Policy on Equal Opportunity

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to education programs and employment. The University is subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Dr. Marianne Phelps, Associate Provost, George Washington University, Rice Hall, Washington, D.C. 20052, (202)994-6508, or to the Assistant Secretary for Civil Rights of the Department of Education.



# Undergraduate Study

The undergraduate program provides a solid foundation in the basic principles, concepts, and techniques of engineering and applied science, on which individuals may build technical competence in a variety of areas as their professional careers develop. The program prepares students for careers in engineering and applied science as they exist today and as they may develop in the future.

Undergraduate study is the beginning of a lifelong program of education. The School provides an environment that fosters the attitudes and disciplines essential to professional growth. Graduates are prepared for productive work in their chosen fields and for further development, both formal and informal. The undergraduate curricula also include courses in the humanities and social sciences so that students understand and appreciate these areas. Since the School cannot predict either a student's response to academic demands or the program that will prove most effective for the student to follow, the undergraduate program has been designed to offer a variety of experiences.

The School is a place for learning and for formulating, exchanging, and exploring ideas. During the undergraduate years, the student is led to strengthen skills in analysis and talent for creative activity through liberal use of laboratory projects. Independent thought and original ideas count more heavily in the appraisal of student achievements than does rote recital of information.

To allow undergraduate students to combine academic learning with practical, firsthand experience in engineering, the School has an optional Cooperative Education Program in Engineering in which industrial and governmental organizations employ students at prevailing salary rates. Every effort is made to place students in positions that provide the best possible experience consistent with career plans. These work periods provide students with income that may be used to finance the major portion of tuition and other expenses. Entering freshmen, as well as transfer students whose completed work is equivalent to requirements in this program, can be admitted to the Cooperative Education Program in Engineering.

## Admission to Undergraduate Study

Admission is the first in a series of qualifying steps in the student's progress toward professional competence in engineering or computer science. It indicates the School's belief that the applicant has at least the minimum preparation and ability needed to complete the curriculum successfully.

The applicant must be of good character and must have an academic background appropriate for the program of studies contemplated.

### Application for Admission

Admission application forms are available from the Office of Admissions, George Washington University, Washington, D.C. 20052. The form must be filled out completely and returned with the stated application fee, paid by check or postal money order payable to George Washington University. The application fee is waived for a student applying for readmission who was registered in a degree program at the time of his or her last registration at GWU and who has not since registered at another institution.

### Entering Freshmen

Consideration for admission is based on the following: (1) an acceptable certificate of graduation from an accredited high school showing at least 16 units;* (2) scores on the College Board Scholastic Aptitude Test (SAT) or on the American College Testing (ACT) battery; (3) high school grades; (4) class standing. Although no minimum scores are prescribed, test results are considered in determining admission eligibility. Students whose combined SAT scores are below 1100 (600 mathematics) or whose ACT composite scores are below 27 (28 mathematics) must show superior academic performance in their high school programs in order to be accepted for admission. In addition, although College Board Achievement Tests in English composition and mathematics are not required for admission to the School of Engineering and Applied Science, it is recommended that applicants submit scores on these tests.

Twelve of the 16 units required for admission must be distributed as follows: four in English; four in mathematics, including two in algebra, one in plane geometry, one-half in trigonometry, and one-half in precalculus, analytical geometry, or functions; one in physics; one in chemistry; and two in history or a foreign language. General science courses do not satisfy the science requirement but may be counted as elective units.

Applicants who do not meet the above requirements may be considered by the School, but additional mathematics or English placement tests may be prescribed.

A graduate of an approved high school who lacks not more than two units (only one of which may be a mathematics or science requirement) of the required subjects and who presents 16 acceptable units may be admitted to a prescribed program that includes courses to make up the deficiencies.

Applicants from secondary schools must arrange to have sent directly from their schools to the Office of Admissions a complete academic record together with a personal evaluation and recommendation from the principal. This information should be supplied on a standard form used by the secondary school.

Applicants who wish to begin study in the summer sessions or fall semester should formulate plans early in the senior year of high school. Although applications should be submitted by March 1, late applications will be accepted on a space-available basis. Students who wish to be considered for financial aid or on-campus housing, however, must submit their applications and all required documents by March 1. Students who wish to begin study in the spring semester should submit their applications, transcripts, and other required documents no later than November 1.

Although decisions on most applications for the fall semester will require submission of seventh-term grades and senior-year test scores, an earlier decision will be given after November 1 to students whose applications become complete with secondary school records through the junior year and junior-year test scores, provided these records clearly establish admissibility.

* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 60-minute periods of prepared classroom work.

### Transfer Students

Undergraduate students from other institutions should submit all applications and required credentials prior to June 1 for the fall semester, December 1 for the spring semester, and April 1 for the summer sessions.

To be considered for admission as a transfer student, an applicant must be in good standing as to scholarship and conduct at all postsecondary institutions previously attended and should have a minimum grade-point average of 2.7 on a 4.0 scale. A student who has been academically dismissed will not normally be considered for admission.

An applicant who has attended one or more institutions of higher education must request each registrar to mail directly to the Office of Admissions a transcript of his or her record, even if credits were not earned.

If an applicant has fewer than 30 semester hours of acceptable work (*C* or better in academic courses from an accredited institution) at the time the application is submitted, his or her high school record and College Board or ACT test scores must be sent to the Office of Admissions directly from the high school and testing agency.

## Students from Foreign Institutions

### Required Records

At the time the application is sent, the applicant must have the educational institutions previously attended send directly to the Office of Admissions copies of official certificates and records listing subjects studied, grades received, examinations taken, and degrees received. Certified copies of diplomas and certificates from all secondary schools, colleges, and universities attended are required. Records of state examinations and certificates are also required. These records become the property of the University and cannot be returned.

These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies sent should be accompanied by a certified English translation.

### Financial Certificate

If an international student plans to study at this University under the authorization of either a student (F) or exchange visitor (J) visa, a Form I-20 or IAP-66 cannot be issued until the student has been admitted to the University and has completed a George Washington University Financial Certificate satisfactorily. The Financial Certificate may be obtained from the Office of Admissions or the School of Engineering and Applied Science. It requests information about the financial resources available to the student to pay his or her educational and living expenses while in the United States. The certificate should be accompanied by supporting documents, such as bank statements or letters from governments authorizing scholarship awards.

### Language Test

Students whose native language is not English are required to take the Test of English as a Foreign Language (TOEFL). Students should address inquiries to TOEFL, Educational Testing Service, CN 6151, Princeton, New Jersey 08541-6151, U.S.A., well in advance of the beginning of the semester for which

admission is sought. The test fee remitted with the application entitles the student to have the test score sent to three different institutions. Registration for the TOEFL does not constitute application for admission to George Washington University.

The TOEFL *Bulletin of Information*, obtainable without charge from the Educational Testing Service (see above for address), contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test, lists of examination centers, examination dates, and an application blank. On the application for the test, the student should specify that the scores are to be sent directly to the Office of Admissions, George Washington University, Washington, D.C. 20052.

In addition, any admitted student whose native language is not English will be required to take the GWU English as a Foreign Language placement test prior to registration. Results of this test will determine the level of English instruction (see English as a Foreign Language courses, page 211) or other courses for which the student will be permitted to register. Students whose knowledge of English is inadequate to enable them to undertake the normal academic load will not be permitted to register for any courses other than English (or English plus a reduced technical load). Students in this category should therefore expect to take a longer period of time to complete their graduation requirements than students who need not complete the additional English courses.

## Readmission

A student previously registered in the University who was not registered on campus during the immediately preceding semester (summer sessions excluded) must apply for readmission. Deadlines for readmission applications are the same as those for undergraduate or graduate admission. If a student has attended one or more institutions of higher education while absent from the University, the student must have complete official transcripts sent to the appropriate office at this University from all institutions attended. Applications for readmission are considered on the basis of regulations currently in effect.

The application fee is waived for a student applying for readmission who was a degree candidate at the time he or she last registered at this University and who has not since registered at another academic institution.

## Advanced Standing

### *Credit by Examination*

Assuming there is no duplication of course work, a maximum of 30 semester hours of credit may be assigned upon admission to the University for any combination of the following.

***College Board Advanced Placement (AP) Tests.*** No credit is assigned for the AP Test in Studio Art. Credit is assigned for all other AP examinations passed with scores of 4 or 5 on the basis of a score report sent to the Office of Admissions from the Educational Testing Service at the student's request. Scores of 3 are considered for credit or waiver by appropriate GWU academic departments; in most cases, submission of the examination booklet will be required. The Advanced Placement Tests are administered in secondary schools in May of each year. Normally only students who complete a course

designated as Advanced Placement are prepared for the examination. Arrangements for the examination are the responsibility of the applicant and should be made through the secondary school attended or with the Program Director, College Board, Advanced Placement Tests, CN 6671, Princeton, N.J 08541–6671.

***College Board College-Level Examination Program (CLEP).*** CLEP offers two types of examinations: General and Subject. CLEP General Examinations are offered in five areas: mathematics, social science and history, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement in specific college-level courses and are offered in 30 subjects.

*New Students.* Upon admission to degree candidacy in the School of Engineering and Applied Science, students may be assigned undergraduate credit for the General Examinations in social science and history (6 semester hours) and humanities (6 semester hours) passed at the 50th percentile or above (college sophomore norms); such credit is assigned in partial fulfillment of the 18 semester hours required in the humanities and social sciences. Credit is not assigned against the engineering curriculum for CLEP General Examinations passed in the areas of mathematics, natural sciences, or English composition.

Credit is assigned for the CLEP Subject Examinations that are applicable to the School's curricula and are passed at the level recommended in the College Board model policy.

*Registered Students.* A candidate for a degree (i.e., a student already registered at the University) must seek departmental approval prior to taking a CLEP Subject Examination for credit. Credit may not be earned by passing the examination after having taken the equivalent course or after having taken a waiver examination for the course.

Arrangements for the examinations are the responsibility of the applicant and should be made with the College Board College-Level Examination Program, CN 6601, Princeton, N.J. 08541–6601.

***Department Examinations for Waiver or Credit.**** Registered SEAS students may also take examinations in some academic departments for waiver of or credit for a specific course upon approval of the appropriate department chair; before the test is administered, the student must have demonstrated sufficient preparation to warrant being given the test. An examination for credit is not allowed if an examination for waiver has been successfully completed or if the student has taken the course.

## Make-Up of Credit for Waived Courses

If a course required by the engineering curriculum is waived, the corresponding semester hours of credit must be earned by satisfactory completion of a university-level academic course, either technical or nontechnical, approved by the student's faculty adviser or department chair. If the substituted course would normally be considered part of the engineering curriculum, the grade earned will be used in determining quality-point index, Dean's List, probation, and suspension. If the substituted course is not part of the engineering curriculum, the grade will not be included in the above computations.

* This does not apply to courses offered in the Department of Electrical Engineering and Computer Science.

### *Waiver of the English Course Requirement*

A waiver of the English course requirement in the core curriculum will be granted to those who achieve a score of 650 or higher on the English Composition Achievement Test of the College Board, a score of 58 or higher on the Test of Standard Written English (TSWE) portion of the SAT, or a score of 28 or above on the ACT English Usage Test.

### *Credit from Other Institutions of Higher Learning*

When no duplication is involved, either through course work or examination, advanced standing may be granted for work successfully completed at other accredited institutions of higher learning. Credit will be granted only when such work meets the requirements for the degree sought at this University. Courses graded *D*, or the equivalent, or lower will not be considered for transfer.

Although there is no strict limit to the total amount of transfer credit that may be assigned, a student must satisfy the residence and course requirements for the degree sought at George Washington University. Students should complete a Transfer of Credit worksheet, available in the SEAS Admissions and Registration Office, and present the worksheet to their adviser for final approval.

### *Credit from Service Schools*

A limited amount of credit may be assigned for selected service school courses. No more than 30 semester hours may be assigned for a combination of service school training and the examinations listed above. Students seeking such credit should consult the Office of Admissions.

### *Credit from Baltimore Polytechnic Institute*

Credit will be assigned to students who have earned scores of 80 or above in A-level courses at Baltimore Polytechnic Institute equivalent to the following SEAS core courses: Math 31, 32; Phys 13, 15; Chem 13; EngS 4; CSci 51.

## Regulations

Regulations regarding registration, fees, and finances are stated on pages 215–20; other University regulations, on pages 230–35.

## Student Status

For the purpose of defining student status, undergraduates taking 12 or more semester hours and graduates taking 9 or more semester hours are considered to be full-time students. All other students are considered to be part time.

## Attendance

Students may not attend classes until registration is completed and fees due are paid or appropriate arrangements are made with the Office of Student Accounts. Students may attend only those classes for which they are registered. Regular attendance is required. Students may be dropped from any course for undue absence.

Students are expected to attend all meetings of the courses in which they are registered, fully prepared to carry on the work required. Students are held responsible for all work in their courses, including work missed because of absence. Excuses for absences from examinations that have been announced in advance can be obtained only by written application to the instructor in charge of the course.

## Academic Work Load

A full-time undergraduate student who is not on probation may register for no more than 21 semester hours. Students on probation may not register for more than 12 semester hours. A student employed more than 24 hours a week may take no more than 10 semester hours. In exceptional cases these limits may be exceeded with the adviser's permission.

## Advisory System

Every entering undergraduate student is assigned a faculty adviser to assist in orientation in the professional discipline. Faculty advisers counsel students on their programs of study, achievement and maintenance of satisfactory scholastic performance, professional development, and extracurricular activity as part of the educational process. The adviser represents the student in all cases requiring faculty action.

Students must obtain their advisers' approval of programs of study prior to registration for each academic semester and summer session. Until the work required for the degree is completed, students must consult with their advisers in all academic matters. However, an adviser may not deny entry into any course or activity to which the student is entitled under the regulations of the School.

All students are encouraged to discuss college problems with their advisers or instructors at any time, and parents or guardians are invited to consult with the dean, associate dean, department chair, and adviser concerning any student problems. Faculty advisers counsel students to the best of the advisers' professional knowledge, but the final responsibility for a student's action lies with the student.

## English Placement Test

For the guidance of the student and the adviser, beginning freshmen who have not waived English 9 or 10 through their English Composition Achievement Test scores or the TSWE (see Waiver of the English Course Requirement, above) must take the placement examination in English. Results on the English placement test determine the level of the English course the student will take.

## Scholarship

***Grades.*** Grades are mailed to the student by the Office of the Registrar at the close of each semester. They are not given out by instructors.

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Unauthorized Withdrawal. The symbol *Z* is assigned when a student is registered for a course that he or she has not attended and for which he or she has done no substantial graded work.

***Pass/No Pass Grading System.*** SEAS students may not take courses required for graduation on the pass/no pass (*P*/*NP*) grading system. They may, however, take courses outside their regular engineering academic program under this grading system.

Students whose status of probation or suspension depends on a grade of *P* are given 30 days to have the grade changed. If not changed by the end of that period, the *P* will be considered a *C* for probation, suspension, Dean's List, and graduation purposes, and a grade of *NP* will be considered an *F*.

***Incompletes.*** The symbol *I* indicates that a satisfactory explanation has been given the instructor for the student's inability to complete the required work of the course. At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course and if the instructor is informed of and approves such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course that is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, that instructor may initiate an appropriate grade change.

If a grade of *I* is not changed to a letter grade of *A*, *B*, *C*, *D*, *F*, or *Z* within 30 days, then decisions on probation, removal from probation, suspension, Dean's List, and graduation will be made with the information on hand, in conformance with SEAS regulations, excluding the *I* grade(s).

Although the grade of *I* may remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work (usually the final examination or required paper) must be made up. The grade of *I* cannot be removed by the student's reregistering for the course here or taking its equivalent elsewhere. A grade of *I* that is not removed after one calendar year will be changed on the permanent record to a grade of *F*. A course in which a student receives an *F* in this way must normally be repeated. The grade to which the *I* is changed will be applied to the grade report for the semester or summer session during which the change is made for the purposes of determining probation, suspension, quality-point index, and Dean's and other honor lists.

***Midsemester Warning.*** At the end of the seventh week of each semester, instructors are expected to report to the dean the names of students whose scholarship is unsatisfactory. On receipt of a warning notice, a student must consult with the appropriate instructor and faculty adviser immediately. The adviser may prescribe diagnostic tests or remedial study, or both, to be completed before the end of the semester.

***Note.*** Grades discussed in the sections below include all grades earned at George Washington University and through the Consortium universities while the student is enrolled at GWU. The grades considered are for academic courses taken in fulfillment of degree requirements and as prerequisites for degree requirements, and not for remedial courses or those taken to make up deficiencies. (For example, EFL courses numbered 45 and below will not be considered for purposes of probation, suspension, or Dean's List.)

Social science, humanities, or technical elective courses taken in excess of the number needed to fulfill the requirements in these areas (including graduate-level courses) are not considered in determining probation, suspension, graduation, or Dean's List status. Only those courses initially taken to meet the requirements will be included in these determinations.

***Quality-Point Index.*** Scholarship is stated in terms of the quality-point index. The index is obtained by dividing the number of quality points by the number of semester hours for which the student registered.

Quality points are computed from grades as follows: *A*, four points; *B*, three points; *C*, two points; *D*, one point; *F*, no points, for each semester hour for which the student has registered. Courses marked *W*, *I*, or *Z* are not considered in determining the index, except that courses marked *I* will be included in the index when a final grade is recorded. All other grades received by a student at George Washington University, regardless of his or her status (i.e., degree, nondegree, or College Program for Secondary School Students), will count in the SEAS quality-point index if the courses are part of the SEAS curriculum.

***Probation.*** A full-time student will be placed on probation if his or her quality-point index is less than 2.0 for one semester or if he or she receives more than one grade of *F* in one semester or summer session. A part-time student will be placed on probation if his or her quality-point index is less than 2.0 or he or she has received more than one grade of *F* when he or she has accumulated 12 semester hours. For academic purposes, a new grading period will begin once this accumulation is reached.

A student on probation who receives a quality-point index of 2.0 or better (for 12 or more credit hours) during the semester on probation but also receives a grade of *F* will be placed on continued probation. Students in this category who receive two *F*s will be suspended.

A full-time student will be removed from probation when his or her engineering curriculum quality-point index is 2.0 or more with no grade of *F* during the semester on probation. A part-time student will be removed from probation when his or her engineering curriculum quality-point index is 2.0 or more and he or she receives no grade of *F* for the next 12 semester hours after being placed on probation.

***Suspension.*** The following cases constitute grounds for suspension: (1) receipt of two grades of *F* any time during a probation period (part-time students receiving two grades of *F* while on probation will be suspended at the time of receipt of the second of these grades); (2) placement on probation in two consecutive semesters (or the equivalent for part-time students); (3) receipt of four grades of *F* in any semester (or the equivalent for part-time students); (4) placement on probation for a third time, whether or not the probation periods are consecutive; (5) accumulation of a quality-point index of (a) 1.5 or less at the end of the sophomore year or upon completion of the 63rd credit in the student's curriculum, (b) 1.9 or less at the end of the junior year or upon completion of the 97th credit in the student's curriculum, or (c) less than 2.0 at any time during the senior year.

Department faculty may designate additional courses to be taken and grades to be received by students who fail to meet but come close to meeting the graduation requirements. Suspension may be held in abeyance until the conditions are or are not met.

Students admitted on probation will be suspended if they do not attain a minimum quality-point index of 2.0 during their first semester (12 or more credit hours) or if they receive more than one grade of *F* during the period.

Once suspended, a student may not have that suspension rescinded by a grade change at a later date. The student may, however, apply for readmission noting the grade change. Students who have been suspended may not apply for readmission until one year after the suspension. To be considered for readmission, a student must have undertaken academic work at another institution,

primarily in mathematics, science, or engineering, during the year of suspension and earned a grade-point average of at least 2.7.

***Dean's Honors and Commendation Lists.*** The faculty of the School recognizes meritorious scholastic achievement by a Dean's Honors List and a Dean's Commendation List, which contain the names of candidates for undergraduate degrees whose scholastic achievements satisfy all of the following requirements while enrolled in an approved engineering curriculum.

1. The student must have completed a minimum of 13 semester hours in one semester with a quality-point index of 3.5 or higher for the Dean's Honors List and a quality-point index of 3.0 or higher for the Dean's Commendation List, with no more than one grade of *C*.
2. No grade below *C* may have been received during the qualifying period.
3. No disciplinary action may have been taken against the student.

The grades used to compute the quality-point index that determines eligibility for the Dean's Honors and Commendation Lists are those used to meet the SEAS graduation requirements. A student who receives a grade of *I* during a semester will not be placed on the Dean's Honors or Commendation List for that semester unless the *I* is removed no later than 30 days after the end of the marking period and the student continues to meet all the requirements for the Dean's Honors or Commendation List.

## Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the associate dean. The associate dean may assign supplementary work, without academic credit, varying with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up any such deficiency in English to the satisfaction of the associate dean.

## Graduation Requirements

See page 233 for general requirements for graduation.

### *Residence*

A minimum of 30 semester hours must be completed in residence. Summer work may be counted. Unless special permission is granted by the dean, the work of the final year must be completed in residence.

### *Scholarship*

To be eligible for graduation a student must have (1) a quality-point index of at least 2.20 in those technical courses specified in the fifth through the eighth semesters of the curriculum and (2) a 2.00 overall average for the entire engineering academic program taken at SEAS.

### *Honors*

Bachelor's degrees with honors are awarded to students whose academic records give evidence of particular merit. The student's quality-point index determines the level of honors as follows: *cum laude*, 3.4–3.59; *magna cum laude*, 3.6–3.79; *summa cum laude*, 3.8–4.0. The quality-point index is

calculated by the Office of the Registrar, and the honors designation is entered on the transcript and diploma of those students who earn an honors designation. To be eligible, a student must complete a minimum of 60 hours of course work at GWU.

***Special Honors.*** A bachelor's degree may be conferred with Special Honors, on recommendation of the faculty, for outstanding achievement in the student's senior-year work. The student must fulfill all of the following requirements.

1. The student must have candidacy for Special Honors approved by the department chair representing the major field not later than the beginning of the senior year.
2. The student must meet such other conditions as may be set at the time candidacy is approved.
3. The student must earn a quality-point index of a least 3.00 on all work taken at GWU that applies to his or her engineering program.
4. The student must have completed at GWU at least one-half of the work required for the degree.

## Undergraduate Curricula

The undergraduate curricula lead to the degree of Bachelor of Science, with parenthetic designation of the major—for example, Bachelor of Science (Electrical Engineering). Full-time students normally complete the curriculum in four years. Students whose academic backgrounds do not meet SEAS admission requirements may need more time; those who are admitted with advanced standing or who attend summer sessions can complete the degree in less time.

The program of the first four semesters (core curriculum), with some exceptions, is common to all curricula and provides the essential base of scientific principles and mathematical techniques necessary for the professional courses of the last four semesters, together with a background in the humanities and social sciences.

A minimum of 130 semester hours is required to qualify for the degree, and certain curricula require more. However, students are encouraged to elect course work beyond the required minimum.

Degrees are offered in civil engineering, computer science, electrical engineering, mechanical engineering, and systems analysis and engineering. Students in mechanical engineering may select options in computer-aided design, energy and power, fluid mechanics and thermal sciences, mechanical engineering design, and solid mechanics and materials engineering. Electrical engineering provides options in computer engineering and premedical engineering. Computer science majors must select one of the following application elective tracks: computer-aided design, digital electronics and hardware, engineering administration, financial systems, management decision systems, management information systems, mathematics, and operations research. Systems analysis and engineering majors must choose an elective track from one of the following areas: computer systems, control and instrumentation systems, electrical energy systems, electromechanical systems, environmental systems, financial systems, management decision systems, mathematical systems, mechanical energy systems, network systems, naval systems, production systems, and statistical systems.

## Courses in the Humanities and Social Sciences

The program in the humanities and social sciences for engineering students helps them to understand the social and humanistic elements of the past and present and to analyze problems facing the world today. Through these studies, the student gains a better understanding of society and an appreciation of the engineer's role and responsibilities.

Since the engineering curricula are, by necessity, oriented toward technical subjects, the program in the humanities and social sciences should consist of courses that broaden the student's outlook. Courses in subjects such as accounting, finance, industrial management, and personnel administration should not be included. On the other hand, courses in areas such as anthropology, economics, geography, history, literature (including foreign-language literature), philosophy, political science, psychology, and sociology are considered appropriate.

With the assistance of his or her faculty adviser, each undergraduate engineering student is required to prepare a program of courses in the humanities and social sciences, explaining how the program meets the purpose stated above. The student's program must include a minimum of 18 semester hours, of which at least two courses (6 semester hours) must form a sequence within one subject area. It must also contain courses selected from *both* the humanities and social sciences and not be confined to one or the other. Both the adviser and the department chair must approve the program.

## Computing and Laboratory Facilities and Research Opportunities

The computing facilities and laboratories at the School of Engineering and Applied Science are constantly updated to keep them in line with current engineering practice. Assignments in the classroom and laboratory are arranged to complement each other.

The learning experience is more meaningful when coupled with research activities. Students may involve themselves in various kinds of research in progress at SEAS—research in structural mechanics, fluid mechanics, thermal sciences, materials science, medical engineering, computer science, electronics, communications networks, energy technology, and other areas.

SEAS provides a wide variety of computing facilities for student and faculty use. Located on the fourth floor of Tompkins Hall, the SEAS Computing Facility includes a network of Apple Talk Macintosh microcomputers, two AT&T 3B2 Unix System V computers, two Sun microcomputer engineering workstation networks, a DEC VAX 11/780 super minicomputer system for graphics research and instructional computing, and a graphics laboratory with advanced color and high-resolution graphics systems from Ramtek, Evans & Sutherland, Raster Technologies, and Sun Microsystems. The DEC VAX 11/780 uses the VMS operating system and supports a wide variety of programming languages, applications, and graphics software.

A generous donation from the Alliant Computer Systems Corporation enabled SEAS to acquire an Alliant FX/8 mini-supercomputer, which provides capabilities in high-speed, high-performance complex problem solving. The Alliant FX/8 system features sophisticated vector and parallel computing and supports instruction and research in areas such as finite and image analysis. In addition, the SEAS Computing Facility has direct access to NSF net for large-scale supercomputing support, and the SURANET, BITNET, and USENET networks are available for national and international communications.

An IBM 4341 Group II computer system configured for computer-aided design and manufacturing applications was awarded to the School by IBM Corporation. This system includes 16 megabytes of main memory, on-line disk storage, color graphics workstations, communications, time-sharing terminals, and a variety of distributed processors, including personal computers and a multitasking laboratory system. Extensive software support, including graphics systems for CAD/CAM, three-dimensional interactive graphics packages, packages for computer-aided design of printed-circuit boards, computer-aided engineering design programs, and SQL database support are provided with this system.

The facility provides technical and operational assistance to all users from 8 a.m. to midnight, Monday through Thursday; 8 a.m. to 7 p.m., Friday; 10 a.m. to 6 p.m., Saturday; and 11 a.m. to 8 p.m., Sunday.

Additional computing facilities, not under the purview of the SEAS Computing Facility, are available to students and faculty at the University Computer Center (see page 236) and in the specialized laboratories of SEAS. The specific laboratory facilities available to SEAS students are described below.

***Two General Purpose Electronics Laboratories*** for work in basic electronics, digital electronics design, instrumentation, networks, solid-state devices, switching circuits, and advanced electronics design. Each laboratory is fully equipped with state-of-the-art Tektronix oscilloscopes, spectrum analyzers and curve tracers, Keithley digital multimeters, Wavetek and HP function generators, Lambda power supplies, and HP universal counters.

***Computer Science Laboratory*** with a PDP 11/34 minicomputer system, a microprocessor development system, and modern microcomputer trainers.

***Graphics Laboratory*** supported by the DEC VAX 11/780 computing system and a Sun microcomputer network and including a Ramtek 9400 high-resolution color graphics system with Matrix camera, Macintosh workstations, a Raster Technologies One/10 color graphics terminal, Sun Microsystem workstations, an Evans & Sutherland PS 300 graphics system, a Printronix graphics printer, and access to an IBM 8 plotter.

***Two Computer-Aided Design Laboratories*** supported by the IBM 4341 computing system featuring eight of IBM's new generation, high-performance 5080 color graphics systems. These systems are complemented by the full spectrum of IBM engineering and scientific software. System output is available through a combination of graphics printers and plotters, including an IBM 4250 publications-quality graphics printer, an ACT-II color ink jet printer, and an IBM 7375 color plotter capable of *E*-size engineering drawings. Workstations for computer-aided design are provided through a network of new IBM PS/2 Model 80 personal computers linked to the IBM 4341.

***Computer-Aided Engineering Laboratory*** for VLSI design, supported by a network of Sun series engineering workstations and sophisticated software.

***Artificial Intelligence (AI) Laboratory*** with three bit-mapped graphics, mouse-driven, Xerox 1108 AI workstations with Ethernet and Expert Systems software, and an IBM 3270 PC with color printer.

***Artificial Intelligence/Software Engineering Laboratory*** equipped with AT&T 3B2 Unix System V host computers, with Unix personal computers and graphics terminals serving as workstations and sophisticated software for use in instruction and research.

***Decision Support Systems Laboratory*** housing 12 IBM personal computers with full graphics capability and a Sony overhead projection system for classroom demonstrations of interactive computer applications.

***Human Factors Laboratory*** supported by IBM–PC/AT computers, statistical packages and graphics software, and various psychometric tests.

***Communications, Microwave, and Laser Laboratory*** with state-of-the-art signal-analysis and signal-generation equipment, admittance meters, impedance meters, RX meters, slotted sections, hetrodyne detection systems, matched terminations, helium–neon lasers, and fiber-optics emitters and detectors.

***Communications Research Laboratory*** outfitted with a PDP 11/44 Computing System.

***Power Systems Laboratory*** equipped with fractional-horsepower machinery and instrumentation for experiments in support of the design and analysis of electrical power systems.

***Control Systems Laboratory*** utilizing microcomputers to control heat, air pressure, motor speed, timers, printers, plotters, and A/D converters through the application of transfer functions.

***Medical Engineering Laboratories*** containing equipment for study and research in a variety of neurological areas, such as electroencephalography and sensory-evoked potentials, and for medical data acquisition and analysis.

***Interactive Systems and Robotics Laboratory*** providing a wide variety of input/output computer peripherals in an integrated, easy-to-use environment. Major equipment includes a Z-80-based microcomputer, an EAI TR20 analog computer, a PA/A Diatonic three-octave keyboard for sound and music synthesis, and two mechanical mobile robots.

***Combustion Diagnostics Laboratory*** with diagnostic equipment using laser scattering concepts and a computer-based data acquisition and analysis system.

***Fluid Mechanics and Hydraulics Laboratories*** complete with a 35-foot tilting water flume with self-contained circulatory system, a circulating water tunnel, hydraulic benches, fully instrumented subsonic wind tunnel, and a 4×6-foot Autotrol Digitizer for conversion of geomorphic river data into digital data.

***Environmental Engineering Laboratory*** with an atomic absorption spectrophotometer for trace metal analysis, a gas chromatograph, a high-pressure liquid chromatograph, and a computerized data system for trace organic analysis.

***Materials Laboratories*** with three materials-testing systems having capabilities of 11,000, 22,000, and 110,000 pounds; a Tinius Olsen Universal Testing machine with a 400,000-pound capacity; several torsional fatigue machines; a torsional creep facility; a Charpy impact tester; and specimen preparation facilities. Analytical equipment includes two Lietz optical metallographs, a scanning electron microscope with energy dispersive X-ray analysis, and a transmission electron microscope.

***Propulsion Laboratory*** equipped with both continuous-flow and blow-down air supply systems for the study of new propulsion techniques.

***Soil Mechanics Laboratory*** well equipped for determining the classification, strength, compressibility, and general engineering properties of soils.

***Thermal Sciences and Instrumentation Laboratories*** designed to support experiments in the various heat-transfer processes and familiarize students with the latest in mechanical engineering measurement and instrumentation techniques.

***High Vacuum Vapor Deposition Facility*** capable of depositing coatings of metals or ceramics on substrates of interest.

**Arrangements may also be made for use of special equipment at** various government laboratories, such as the Naval Research Laboratory, the National Bureau of Standards, and the National Aeronautics and Space Administration.



## Graduate Study

The School of Engineering and Applied Science offers graduate study leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science and to the professional degrees of Engineer and Applied Scientist.

In its graduate programs, as in its undergraduate curricula, the School emphasizes the development of knowledge and understanding through concentration on principles and their application rather than through encyclopedic coverage of techniques and specialized detail. Each program is individually planned according to the student's preparation and needs.

Graduate study may be undertaken in any field of engineering or applied science in which the School has established a formal program of studies and for which there are adequate facilities and resources. Upon approval of his or her adviser, the student may select courses in other departments of the University to serve specific needs or objectives. A complete list of available fields and areas of concentration is included under each departmental listing in the Programs of Study and Courses of Instruction section of this *Bulletin*.

## Admission

Admission application forms are available from the School of Engineering and Applied Science. They must be submitted with the specified nonrefundable application fee to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052, no later than August 1 for the fall semester, December 1 for the spring semester, May 1 for the first summer session, and June 1 for the second summer session. For international students the following application deadlines apply: no later than June 15 for the fall semester, October 15 for the spring semester, and March 15 for any of the summer sessions.

The applicant must request that each educational institution attended since high school graduation send an official transcript of the student's record directly to the manager of engineering admissions. Although scores on the Graduate Record Examination (GRE) are not required, the applicant who has completed the GRE should request that the scores be sent to the School.

An applicant to the Doctor of Science program must, in addition, arrange for letters of recommendation to be submitted from two faculty members of the institution from which he or she received the master's degree. One of these, if possible, should be from the master's adviser. The letters should be addressed to the appropriate department chair. After submitting the admission application form, the doctoral applicant may schedule personal interviews to discuss his or her qualifications and possibilities for an effective doctoral program.

Normally, graduate students who have been suspended from SEAS must wait at least one year before applying for readmission.

All inquiries and correspondence concerning graduate admission should be directed to the manager of engineering admissions. The applicant will be notified by mail when a decision on admission has been made.

For specific admission requirements, please see individual degree programs.

### English Language Requirements for International Students

Students whose native language is not English must take the Test of English as a Foreign Language (TOEFL). The results of the test must be sent by the administering institution directly to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052.

Students whose native language is not English and who are newly enrolled in any degree program offered by the Department of Engineering Administration must also take, prior to registration, the GWU English as a Foreign Language placement test administered by the English for International Students program. The results of the test will determine whether the student must complete English as a Foreign Language (EFL) course work before enrolling in other courses.

Students admitted to degree programs in departments other than Engineering Administration will be required to take the GWU English as a Foreign Language placement test if they score below 550 on the TOEFL. The placement test will determine the level of the English instruction to be taken and the maximum number of technical courses, if any, that can be taken concurrently with EFL courses in a semester. Students admitted with English requirements should expect to spend more time in completing their studies at the University than do students who need not complete the additional English courses.

Students who score below 425 on TOEFL will not be admitted to the University in full degree status. However, those who meet all of the technical requirements for admission and have outstanding academic records may be admitted on a provisional basis. Such students will have degree status only when they have successfully completed the level of EFL 30 (see page 211) within one calendar year of the date of registration.

International students transferring from an academic institution in the United States or from another English-speaking institution, or who have demonstrated English proficiency at such institutions, may be admitted without a TOEFL score at the discretion of the admitting officer, but they may be required to take the GWU English as a Foreign Language placement test prior to registration.

International students already in the United States may take the GWU English as a Foreign Language placement test in lieu of the TOEFL.

Additional information and requirements for international students are outlined on pages 14–15.

### Transfer of Credit

Up to 6 semester hours of credit may be accepted in transfer, when applicable, to meet degree requirements of the School, if approved by the student's adviser and department chair. The credit must have been completed with grades of *A* or *B* at another accredited and recognized institution, at a level of study equivalent to that being pursued at GWU. In addition, the professional and doctoral degree programs require that the credit be earned no more than five years prior to admission to the GWU program, and some departments require that it be earned more recently. Credit applied toward a previous degree may not be transferred.

## Regulations

Regulations regarding registration, fees, and finances are stated on pages 215–20; other University regulations, on pages 230–35.

### Attendance

Students may not attend classes until registration is completed and fees due are paid or appropriate arrangements are made with the Office of Student Accounts. They may attend only those classes for which they are registered. Students are expected to attend all meetings of the courses in which they are registered, fully prepared to carry on the work required. Students may be dropped from any course for undue absence.

### Grading System

The following grading system is used: *A*, Excellent; *B* Good; *C*, Minimum Pass; *F*, Fail; *CR*, Credit (for satisfactory thesis completion); *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Unauthorized Withdrawal.

At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond his or her control, is unable to complete the work of the course and if the instructor is informed of and approves such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course that is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented, the instructor may initiate an appropriate grade change. Although the grade of *I* may remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work must be made up. The grade of *I* cannot be removed by the student's reregistering for the course here or taking its equivalent elsewhere. An incomplete that is not removed within one calendar year is automatically changed to an *F*.

The symbol *Z* is assigned when a student is registered for a course that he or she has not attended and for which he or she has done no substantial graded work. The grade of *Z* will not be considered in determining the quality-point index.

***Pass/No Pass Grading System.*** SEAS students may take SEAS courses under the pass/no pass grading system, but credit for such courses cannot be used toward any degree program in SEAS.

***Quality-Point Index.*** Scholastic standing is computed in terms of the quality-point index, obtained by dividing the number of quality points by the number of semester hours for which the student registered.

Quality points are computed from grades as follows: *A*, four points; *B*, three points; *C*, two points; *F*, no points, for each semester hour for which the student registered. Courses marked *W*, *I*, or *Z* are not considered in determining the index, except that courses marked *I* will be considered when a final grade is recorded. With the exception of courses taken at one of the Consortium universities, grades in courses taken at other institutions are not considered in computing the quality-point index.

### Residence and Continuous Enrollment

All work for the degree must be done in residence unless a special exception is granted by the department chair. In addition, a student in a degree program is expected to be continuously enrolled in the School until the degree is conferred. A student who breaks his or her registration must apply for readmission to the degree program under whatever conditions and regulations are in force at that time. To maintain continuous enrollment, a student may register in one of the following categories.

***Inactive Status or Leave of Absence.*** This status is available to students who are (1) awaiting graduation (with all requirements completed), (2) attending classes at another institution (with special approval), (3) temporarily transferred out of the area (e.g., for military TDY), (4) having temporary medical problems, or (5) undertaking cooperative education work assignments.

***Continuous Research.*** Students may enroll for 1 semester hour under this designation to prepare for or take the comprehensive or qualifying examination.

## Master's Degree Programs

The student's program may cover a variety of fields or may concentrate in particular areas. The minimum program consists of 24 semester hours of approved graduate courses and a master's thesis (equivalent to 6 semester hours). With the approval of the department, the student may elect an optional program without a thesis that consists of a minimum of 33 semester hours of approved graduate courses. Students whose undergraduate study does not include necessary prerequisites may be required to take additional course work. All master's candidates must also pass a Master's Comprehensive Examination.

Upon admission, the student is assigned an adviser. Programs of study are determined by established prerequisites and the requirements of the department in which the student wishes to study. The program of study in preparation for the Master's Comprehensive Examination must be approved by the student's adviser and the department chair.

### Admission Requirements

Admission to study toward a master's degree requires an appropriate bachelor's degree from a recognized institution and evidence of capacity for productive work in the field selected, such as may be indicated by undergraduate grades, GRE scores, and similar data. (GRE scores are not required for admission to SEAS; however, students who have taken the GRE are encouraged to submit their test results.)

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate courses as an unclassified student before being admitted to degree candidate status. If such deficiencies are minimal, the applicant may be admitted directly to degree candidate status and allowed to take a limited number of graduate courses while completing the undergraduate courses in which he or she is deficient. In no case may the undergraduate courses thus taken fulfill any part of the requirements for the master's degree.

For admission requirements of a specific master's program, please see the department concerned under Programs of Study and Courses of Instruction.

### Master's Thesis

The master's thesis, when required, must demonstrate the student's ability to make independent use of the knowledge and discipline of thought acquired through graduate study, to undertake constructive work in a given field, and to communicate the results of the work in writing. Suitable work for which the student has professional responsibility may be considered, whether done on or off campus, provided no significant amount of work is completed without faculty supervision.

To register for the thesis course (299), the candidate must submit the thesis area to the appropriate department chair, on the form obtained from the department office and approved by the faculty adviser. At the beginning of the semester of expected graduation, the candidate must submit the thesis title to the dean, on the form available in the department office. While registered in the thesis course sequence 299–300, the student is entitled to the advice of the faculty member under whom the thesis is to be written. Students may consult with their advisers, but they have primary responsibility for the thesis.

The thesis in final form must be submitted to the department chair by the date stated in the calendar for the semester in which the candidate enrolls in thesis course 300. In the event a thesis is unfinished on the date specified, the student will be granted an additional semester. If preparation of the thesis extends beyond three semesters, the student must have an extension of time approved, reregister for thesis course 300, and pay tuition as for a repeated course. The overall time limit for earning the degree (see Time Limits, below) may not be exceeded.

A thesis may be submitted in final form one time. The acceptability of the thesis is determined exclusively by the Master's Comprehensive Examination committee. If the thesis is unacceptable, the student's graduate status is terminated.

Copies of detailed regulations regarding the form and reproduction of the thesis are available in the department office. Accepted theses, with accompanying drawings, become the property of the University and are deposited in the Gelman Library, where the duplicate copies are bound and made available for circulation.

### Optional Master's Program Without a Thesis

With the approval of the department, a student may elect an optional program without a thesis that consists of a minimum of 33 semester hours of approved graduate courses.

### Master's Comprehensive Examination

The student must pass a Master's Comprehensive Examination to demonstrate substantial understanding of principles and methods and their use in the area of interest. This examination may be written, oral, or both. A graduate student who fails any portion of the Master's Comprehensive Examination on the first attempt may be examined once more if approval is given by the examining committee. If the student again fails to complete the examination satisfactorily, graduate status is terminated.

### Scholarship

A student who receives two grades of *F* or three grades below *B* is barred from further enrollment in graduate courses and, ordinarily, will not be readmitted as a degree candidate.

A student may not repeat for credit a course in which he or she has received a grade of *C* or above, unless required to do so by the department chair. A written statement requiring the student to repeat such a course for credit must be submitted to the registrar by the department chair.

### Graduation Requirements

***Program With Thesis.*** In addition to 6 semester hours of acceptable thesis, a student must have either (1) 24 semester hours of *B* or better with no more than two grades below *B*, of which only one may be an *F*, or (2) a 3.00 quality-point index for a minimum of 24 semester hours with no more than two grades below *B*, of which only one may be an *F*.

***Nonthesis Option.*** A student must have either (1) 33 semester hours of *B* or better with no more than two grades below *B*, of which only one may be an *F*, or (2) a 3.00 quality-point index for a minimum of 33 semester hours with no more than two grades below *B*, of which only one may be an *F*.

### Time Limits

A full-time student in the master's program is allowed a maximum of three calendar years (excluding the time spent taking only English as a Foreign Language courses) to complete all degree requirements, from the date of first registration as a degree candidate in prerequisite or graduate courses. A part-time student in the master's program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to degree candidate status or any period spent on approved leave of absence.

Students who do not complete degree requirements within the allowed time will have their degree candidate status terminated. They may be readmitted to degree candidate status under conditions specified by the department chair and approved by the dean.

## Professional Degree Program

The School of Engineering and Applied Science has established the professional degree program for those students who wish to pursue course work beyond the master's degree with emphasis on applied subject material rather than on basic research. The program has been designed to satisfy the needs of industry and government for highly trained technical personnel in engineering and applied science.

The student's program may cover a variety of fields or concentrate in particular areas. The minimum program consists of 30 semester hours of approved graduate courses beyond a master's degree. Students whose graduate study does not include necessary prerequisites may be required to take additional course work.

Successful completion of the professional degree program leads to the degree of Engineer or of Applied Scientist.

### Admission Requirements

Admission to study toward the professional degree requires an appropriate master's degree from a recognized institution and evidence of capacity for productive work in the field selected as indicated by prior scholarship and, where appropriate, professional experience. The Department of Electrical Engineering and Computer Science requires applicants for the professional degree program to have had two years of professional experience after receiving the master's degree.

***Engineer.*** To study toward the degree of Engineer, an applicant must possess a master's degree and a bachelor's degree in an area of engineering.

***Applied Scientist.*** To study toward the degree of Applied Scientist, an applicant must possess a bachelor's degree in engineering, mathematics, or natural science and a master's degree in engineering, natural science, mathematics, or administration. Applicants who have an equivalent quantitative background may be considered as special cases by the respective departments.

Normally, a *B* average in graduate work is required. However, the minimum does not assure acceptance; the departments may, and often do, set higher admission standards.

For admission requirements of a specific professional degree program, please see the department concerned under Programs of Study and Courses of Instruction.

### Program of Study

Upon admission, the student is assigned an adviser. Programs are determined by established prerequisites and the requirements of the department in which the student wishes to study. The program of each professional degree candidate must be approved by the student's adviser and the department chair.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate and graduate courses as an unclassified student before being admitted to degree candidate status. In no case may courses thus taken fulfill any part of the requirements for the professional degree.

Each department may require its degree candidates to undertake and defend the results of a technical design project or a development problem or to prepare a comprehensive technical report to demonstrate the candidate's ability to make independent use of the knowledge and discipline of thought acquired through graduate study. When applicable, the student will be informed of this requirement by the faculty adviser at the time the student's program is being formulated. In no case, however, will this project be more than 6 semester hours out of the minimum 30.

### Scholarship

If a student studying for the professional degree receives two grades of *F* or three grades below *B*, study is terminated and further enrollment prohibited. A student must have a final quality-point index of 3.00 to receive the degree.

### Time Limits

A full-time student in the professional degree program is allowed a maximum of three calendar years to complete all degree requirements, from the date of

first registration as a degree candidate in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to degree candidate status or any period spent on approved leave of absence.

Students who do not complete degree requirements within the allowed time will have their degree candidate status terminated. They may be readmitted to degree candidate status under conditions specified by the department chair.

### *Relationship with the Doctoral Program*

Candidates for the Doctor of Science degreeor professioal degree who are in good academic standing may, with the approval of the faculty adviser and department chair, transfer from one degree rogram to the other within their department if they meet the qualifications and requirements specified by the department.

## Doctor of Science Degree Program

The doctoral program is designed to prepare the student for a career of creative scholarship by providing a broad but balanced background of knowledge and guidance in the performance of research. The program is divided into two stages. The first—made up of a study of related fields of learning that support the general area of research concentration—culminates in the qualifying examination. The second—composed of original research and the presentation of findings in a written dissertation—culminates in the final examination.

### *Admission Requirements*

Admission to study toward a doctoral degree requires an appropriate master's degree from an accredited institution together with acceptable personal qualities and a capacity for creative scholarship. Normally, a *B* average in graduate work is required. However, the minimum does not assure acceptance; the departments may, and often do, set higher admission standards.

For admission requirements of a specific Doctor of Science degree program, please see the department concerned under Programs of Study and Courses of Instruction.

### *Language Requirement*

Since the doctoral program emphasizes the importance of scientific and technical contributions originating from other countries, some areas of study demand the ability to read appropriate literature in a foreign language. Therefore, departments have the option of requiring reading knowledge of such a language.

### *Tool Requirement*

In addition to or in lieu of the language requirement, an examination in a tool requirement (for example, computer programming) may be established by the department.

### Study for the Qualifying Examination

Upon admission to the first stage of the program (that is, study of related fields culminating in the qualifying examination), the student is assigned a faculty adviser who directs his or her studies. The adviser approves appropriate fields of study to ensure the student's breadth of knowledge and to support research in the central field of interest, gives advice concerning the scope and content of fields of study, and guides preparation for the qualifying examination. In some departments, instead of a single adviser a faculty committee may be appointed to approve programs, direct study, and carry out all other advising responsibilities. Programs of study are normally structured to include a major field and two minor or supporting fields.

A minimum of 30 semester hours of credit in a formal program at the graduate level beyond master's study is required. In many cases, particularly when the student undertakes a doctoral program in a field other than that in which the master's degree was obtained, the program of study exceeds 30 semester hours.

Students admitted to doctoral study are encouraged to undertake one year of full-time study on campus. In general, the adviser will require the student to register for a minimum of 6 semester hours of course work in every semester except the summer sessions.

### The Qualifying Examination

The qualifying examination is the principal means of determining whether a student will qualify as a candidate for the doctoral degree and progress to the second stage of the program. Its purpose is to ascertain that the student's background and intellectual development are adequate to support doctoral research in the central field. (Some departments may administer a prequalifying examination prior to completion of the study program.)

Qualifying examinations may be written or oral, or both, and are scheduled over a period of several days. They are conducted only during the fall and spring semesters, on dates established by the departments, and are administered by a faculty committee. Upon favorable report of the examiners to the dean through the department chair, the student is admitted to candidacy for the degree; the student then begins specialized study and research under the supervision of a designated member of the faculty or, in special instances, an outstanding engineer or scientist who is not a member of the faculty.

At the discretion of the committee that prepared the examination, a student who fails any part of the qualifying examination may be given a second opportunity to qualify for candidacy. Usually, the entire examination must be retaken.

Students who fail to qualify for candidacy in a doctoral program of the School will be considered to have failed on a school-wide basis and will not be admitted to further doctoral study within the School.

### Scholarship

To be admitted to the qualifying examination, the student must have an overall quality-point index of 3.20. If a doctoral student receives two grades of *F* or three grades below *B*, graduate study is terminated and further enrollment prohibited. Courses in which the student earns grades below *B* are not

included in the total semester-hour requirement for the degree. Students who receive any grade below *B* are required to review their programs of study with their advisers and discuss possible changes.

### *Research, Dissertation, and Final Examination*

The student admitted to candidacy for the degree of Doctor of Science chooses the faculty member under whom he or she wishes to conduct research; the faculty member may accept or reject the request to serve as the student's director of research. The research area is approved by the director and throughout the remainder of the doctoral program the candidate conducts dissertation research under the director. However, the student may consult other members of the faculty as required, on an informal basis, and may be encouraged to do so by the director of research. A committee of the faculty, consisting of three members and including the director as chair, will advise in final preparation of the dissertation. The department chair appoints this committee on the recommendation of the director of research. Work on the dissertation is equivalent to a minimum of 24 semester hours.

***The Dissertation.*** A dissertation is required as evidence of ability to perform original scholarly research and to present and interpret the results. The student is solely responsible for the content of the dissertation.

The dissertation should embody the results of an extended original study and include material deemed worthy of publication in recognized scientific and engineering journals. The student is expected to attempt to have the results of the research published as soon as possible after he or she receives the degree and to submit copies of the published material to the dean. Credit must be given in the publication to the fact that the material is abstracted, summarized, or developed from a dissertation submitted to George Washington University in partial fulfillment of the requirements for the Doctor of Science degree.

The candidate must submit to the department five complete copies of the dissertation and an abstract (not to exceed 350 words) no later than the date specified in the calendar. The abstract is included in the announcement of the examination and is reproduced by University Microfilms, Inc. One copy of the dissertation is also sent to University Microfilms, Inc.

Copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available in department offices. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee to cover part of the expense of printing the abstract and for the basic service rendered by University Microfilms, Inc. Accepted dissertations, with accompanying drawings, become the property of the University and are deposited in the Gelman Library, where bound copies are available for circulation.

***The Final Examination.*** Upon acceptance of the dissertation by the research committee, the candidate is presented for the final examination. The final examination is oral and is open to the public. The candidate must demonstrate a mastery of the special field of study and of the materials and techniques used in the research. The committee of examiners will consist of at least five members, three of whom must be full-time faculty members. The committee may include qualified experts brought to the University especially to participate in the examination. The director of research serves as advocate for the candidate. When the examining committee is convinced of the high quality and originality of the candidate's contribution to knowledge as

well as his or her mastery of the scholarship and research techniques of the field, the committee recommends the candidate for the degree of Doctor of Science. The final examination is conducted only during the fall and spring semesters. The candidate should consult the department chair about scheduling the examination.

### Enrollment Requirements

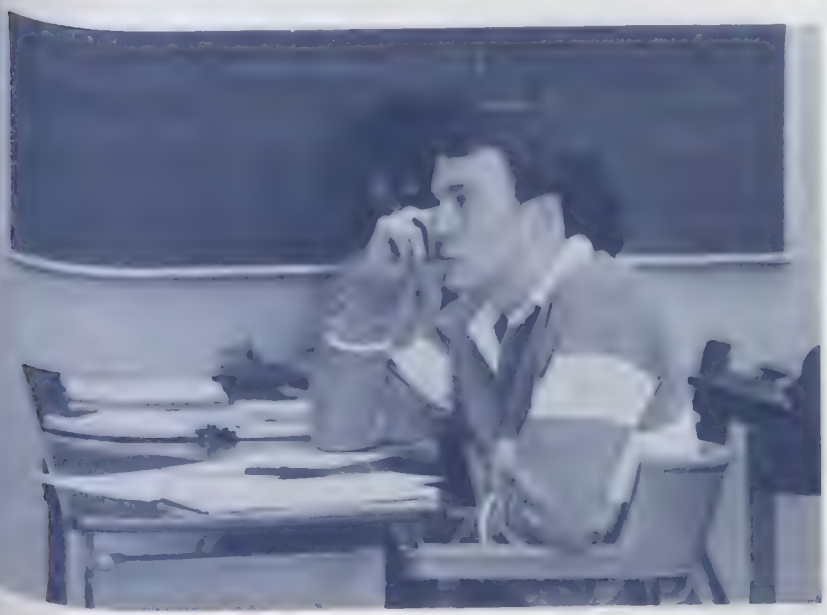
Full-time doctoral students must register for a minimum of 12 hours per semester until 24 hours of work have been completed beyond the qualifying examination and one hour of dissertation research (course number 399) each semester thereafter until satisfactory completion of the final examination.

Part-time doctoral students must register for a minimum of 6 hours per semester until 24 hours of work have been completed beyond the qualifying examination and one hour of dissertation research (course number 399) each semester thereafter until satisfactory completion of the final examination.

No minimum load is required during the summer sessions.

### Time Limits

In general, one year of study is the minimum amount of time to be spent in preparation for the qualifying examination, although the student may apply for the examination whenever he or she feels properly prepared. The qualifying examination must be completed within five years of the date of admission, and the entire degree program must usually be completed within seven years. (Full-time students in the doctoral program in engineering administration are allowed a maximum of five calendar years to complete all degree requirements.) A minimum of two years of full-time study and research should be expected in meeting the requirements for the degree. The time period for completion of the degree will be adjusted for an approved leave of absence.



# Special Programs

## Research Institutes

### Institute for the Study of Fatigue, Fracture, and Structural Reliability

The basic objective of the Institute for the Study of Fatigue, Fracture, and Structural Reliability of the School of Engineering and Applied Science is to develop an interdisciplinary approach to fatigue research through close cooperation among research workers from different fields. The institute deals primarily with the study of the physical mechanism of damage initiation in order both to establish principles for the design of metal alloys of superior fatigue performance and to develop advanced methods of fatigue design and reliability. Because much straight fatigue testing of standard test specimens is and has been done by industrial, government, and university laboratories, no testing of this type is generally conducted by the institute. However, results of such tests appearing in publications and reports are carefully scrutinized for their significance in terms of the purposes of the institute. In addition to advancing interdisciplinary research, the institute provides specialized training for graduate students.

The institute conducts seminars, issues technical reports, and provides information, lectures, and consultations to many government and industrial research and development laboratories.

### Institute for Management Science and Engineering

The Institute for Management Science and Engineering defines and develops new analytical management techniques to keep pace with an ever-expanding technology. It provides a multidisciplinary environment for graduate teaching, research, and public service in fields such as operations research, mathematics, statistics, economics, and computer science.

The programs of the institute are concerned with conservation of national resources. Through its Program in Logistics, the institute performs research focused on developing a science of logistics with principles and methodology for resource allocation in civil affairs and national defense. Other programs involve optimization, reliability, queuing, forecasting, and cost–benefit analyses.

The institute encourages participation by faculty members and graduate students from all schools in the University. Qualified graduate students may apply for research assistantships, which ordinarily support thesis and dissertation efforts. The programs of the institute also rely on staff research specialists, and there are special provisions for inviting distinguished visitors from government, private industry, and other universities.

The institute disseminates its results through seminars, colloquia, conferences, and a special series of monographs. All research is unclassified.

### Institute for Reliability and Risk Analysis

The Institute for Reliability and Risk Analysis (IRRA) promotes basic and applied research in the mathematical and statistical aspects of reliability theory, risk analysis, quality control, and industrial statistics. The work of the

IRRA involves University faculty, visiting professors and scholars, scientists from government and industry, and doctoral-level graduate students.

Visiting professors and qualified graduate students may be supported through research grants, scholarships, and fellowships. The major effort of graduate students is in research toward the doctoral dissertation. In the past, major support for research at IRRA has come from the U.S. Army Research Office, the Office of Naval Research, the U.S. Nuclear Regulatory Commission, the Los Alamos Scientific Research Laboratories, and the U.S. Naval Air Systems Command as well as private industry, such as the Association of American Railroads, Ketron, and General Motors Corporation.

IRRA sponsors seminars and colloquia, featuring distinguished scientists, for the general public and the University community and issues technical papers and research reports to disseminate research results.

## International Water Resources Institute

The International Water Resources Institute was created to foster a multidisciplinary approach to planning, developing, and operating water resources systems and solving water resources problems on both the national and international levels.

The institute emphasizes basic and applied research, technical development, transfer of knowledge, professional and scientific services, and special educational needs. It conducts seminars and supplies information to government agencies and private concerns in the United States and abroad, creating an international flow of knowledge about water resources problems and their possible solutions.

## Institute for Information Science and Technology

The Institute for Information Science and Technology was created by the Department of Electrical Engineering and Computer Science to provide a framework for research, facilitate cooperation, and share resources in the areas of telecommunications, data networks, signal processing, control theory, and logic design; computer architecture, graphics, and languages; and artificial intelligence and robotics. The institute is operated by a core staff and faculty and researchers from George Washington University. In addition, visiting scholars and fellows from government and industry fill research positions while pursuing advanced studies. The institute produces research publications, grant and contract reports, and scholarly papers; sets up system design and development demonstrations; and sponsors continuing education programs, seminars, and conferences.

Because the rapid pace of technological innovation demands that universities and industry work closely together, the ***Industrial Liaison Program*** (ILP) has been established to foster cooperation and communication between the Department of Electrical Engineering and Computer Science, the Institute for Information Science and Technology, and companies that depend on the fields represented by the department. The ILP offers participating companies a research center with which employees can interact and closer ties with university faculty and students. For the department, the ILP provides a way to gain better understanding of the needs of industry, so that research and teaching can be made more relevant; to disseminate research results quickly to those who can benefit from their application; and to secure the resources

needed to strengthen research facilities and programs. Funds made available through the Industrial Liaison Program also provide fellowships and assistantships for graduate students.

## Institute for Artificial Intelligence

The Institute for Artificial Intelligence (IAI) was formed to unite, strengthen, and extend ongoing activities at the University. In particular, the IAI pursues an interdisciplinary approach to the research, development, testing, and evaluation of artificial intelligence aids to human endeavor in engineering and science, in manufacturing and industrial operations, and in policy and decision making. Ongoing research projects include cognitive modeling, intelligent interfaces, expert systems, computer-aided manufacturing, and automatic programming.

## Institute for Technology and Strategic Research

The Institute for Technology and Strategic Research (ITSR) has been established as a university-based technical organization to provide unbiased assessments of technological innovations in light of national security goals. The institute facilitates research on the mid- to long-term relationships between technology and national security requirements; presents timely and original analyses of matters related to key national decisions; and sponsors relevant seminars, workshops, and colloquia. It encourages public discussion and promotes cooperation among government, academia, and industry.

Since an important objective of ITSR is to increase understanding of the interdependence of science, technology, and international security and of the technological challenges that will shape the future international environment, the institute's programs are conducted in close cooperation with GWU's School of International Affairs and with the participation of the Columbian College of Arts and Sciences, Graduate School of Arts and Science, National Law Center, and School of Government and Business Administration.

## Institute for Medical Imaging and Image Analysis

A collaborative effort of the SEAS Department of Electrical Engineering and Computer Science and the Department of Radiology of the School of Medicine and Health Sciences, the Institute for Medical Imaging and Image Analysis conducts research into all aspects of this field, including image generation, transmission, display, evaluation, enhancement, and interpretation. Current projects, for example, involve the design and implementation of digital imaging networks and their workstations, coding and archiving of images, tissue characterization, and three-dimensional representations. The results of this research are disseminated through colloquia, technical reports, and research papers and are applied in both clinical and technological settings: for teaching and diagnosis and for the development of software and hardware that will provide better and more useful images.

Faculty from both departments, clinicians in radiology, visiting professors and scholars, and doctoral students participate in the work of the institute and regularly exchange ideas with scientists from government and industry. The institute's research is supported by funds from the federal government, medical and trade associations, and private industry.

## GWU/NASA–Langley Joint Institute for Advancement of Flight Sciences (JIAFS)

The Joint Institute for Advancement of Flight Sciences was established in 1971 through the combined efforts of the National Aeronautics and Space Administration's Langley Research Center and the George Washington Universitys' School of Engineering and Applied Science. The institute, located at the Langley Research Center in Hampton, Virginia, is dedicated to the advanced training of students and professional engineers in aeroacoustics, aeronautics, astronautics, and related areas. It also serves as a center for advanced research in these areas by providing facilities for qualified researchers and scholars. Richard W. Barnwell, Chief Scientist, NASA–Langley Research Center, is director of the institute and Harold Liebowitz, Dean of the School of Engineering and Applied Science, is codirector.

The JIAFS offers students closely related instruction and research opportunities that draw on the academic resources of the University, the professional research facilities of the NASA–Langley Research Center, and the expertise of visiting scholars and researchers. Current programs are described below.

***Aeroacoustics Program.*** This program is concerned with the problems of alleviating noise and with providing a technical base for design of acceptable aircraft and space vehicles, noise-resistant structures, and ground transportation systems. Areas of research include boundary-layer noise, duct acoustics, jet noise, nonlinear problems in acoustics, structural response to noise, and mechanical and acoustical coupling problems.

***Aeronautics Program.*** This program deals with advanced flight concepts of various aircraft, including aerodynamics, performance, flight dynamics, instrumentation, guidance and control, aeroelasticity, and systems analysis. Areas currently being investigated include aerodynamic analysis of jet augmented wings, theoretical fluid mechanics, performance, stability and control of aircraft, wind tunnel and flight testing of aircraft, airfoil aerodynamics, stall-spin characteristics of aircraft, computational fluid dynamics, and experimental evaluation of aircraft handling characteristics.

***Astronautics Program.*** This program is concerned with the problems associated with flight and existence in space. Research areas include advanced propulsion systems, conceptual design of launch vehicles and spacecraft, control of large space structures, and characteristics of hypersonic flight.

Graduate Research Scholar Assistants, faculty from George Washington University, scientists and engineers from NASA–Langley, and visiting scientists and engineers participate in these programs.

A number of Research Scholar Assistantships are available to qualified students pursuing Master of Science and Doctor of Science degrees in the fields of aeroacoustics, aeronautics, and astronautics. Research Scholar Assistants receive full tuition remission and stipends of $10,000 a year for master's degree candidates and $12,000 a year for doctoral students. Application forms, a JIAFS brochure, and additional information may be obtained from Professor John L. Whitesides, JIAFS–George Washington University, Mail Stop 269, NASA–Langley Research Center, Hampton, Va. 23665–5225.

### *GWU/NASA–Langley Graduate Program*

George Washington University, in cooperation with the Langley Research Center, offers a graduate engineering program at NASA–Langley. The program is open to qualified NASA employees and area residents. Courses may also be taken by nondegree students, with the approval of the instructor. Students may be permitted to transfer a maximum of 6 semester hours of approved graduate course credit from other accredited institutions.

Courses in the program are taught by NASA scientists and engineers and the faculty of the School of Engineering and Applied Science. NASA–Langley's extensive scientific and engineering facilities are used whenever possible.

The program at NASA–Langley leads to the degrees of Master of Science and Doctor of Science (by special permission of the appropriate department chair) and to the professional degree of Engineer in the fields of aeroacoustics, aeronautics, astronautics, fluid mechanics and thermal sciences, solid mechanics and materials engineering, structures and dynamics, and engineering administration (M.E.A. only).

Information regarding this program may be obtained from Professor John L. Whitesides, GWU/NASA Program, Mail Stop 269, NASA–Langley Research Center, Hampton, Va. 23665–5225.

## Continuing Engineering Education Program

The School of Engineering and Applied Science offers a comprehensive program of noncredit courses designed to enhance the competence of practicing engineers. The Continuing Engineering Education Program provides both review courses and the latest information in the engineering, scientific, and engineering administration fields. It enables engineers to keep pace with the rapid advances in scientific and technological knowledge, expand their areas of

expertise, and acquire additional skills necessary for professional certification or promotion.

The program presents more than 500 noncredit short courses annually. All courses emphasize practical applications. The presentation of theory is often augmented by workshops to give participants actual experience in a specific discipline. New courses are continuously being developed and older courses revised and updated. In addition to the faculty of the School of Engineering and Applied Science, outstanding lecturers and instructors from other universities, industry, and government laboratories and agencies serve on the instructional staff of the program. The majority of courses are presented on the George Washington University campus in Washington, D.C. Courses are also routinely scheduled for presentation throughout the United States, Canada, and Europe.

The program also offers noncredit courses presented on-site for organizations. The content of an on-site seminar can be tailored to the training needs of the sponsoring organization, and the teaching schedule can be adjusted to fit the organization's requirements. Tuition for sponsored courses is usually appreciably lower than advertised courses.

The Continuing Engineering Education Program offers courses in the following fields:

Aerospace and aeronautical engineering
Civil engineering, transportation, and construction
Computer and information management sciences
Communications engineering
Electrical and electronic engineering
Energy and environmental systems engineering
Engineering management
Geotechnical engineering
Industrial engineering
Mechanical engineering
Medical engineering
Nuclear engineering
Quality assurance
Statistics, reliability, and operations research

To receive announcements or additional information, write to Continuing Engineering Education Program, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052, or call (202)994-6106 or (800)424-9773 in the United States, (800)535-4567 in Canada.

## Special Programs for Undergraduates

### Cooperative Education Program in Engineering

Cooperative education is a process that formally integrates academic study with work experience in cooperating employer organizations. Usually, students alternate periods of college study with periods of experience in appropriate fields of industry and government, which are considered an integral part of the student's education. Through the interaction of study and work, the student enhances academic knowledge, personal development, and professional preparation. The teaching faculty, the coordinators, and the employing

supervisors share in the educational process of the cooperative education student.

Cooperative education students in a work assignment are considered full-time students for purposes of housing and campus privileges. They are not considered as full-time students for Veterans Administration benefits, financial aid, or visa purposes. The wages received as compensation for work performed under the Cooperative Education Program are taxable income per Section 61 of the IRS Code.

## Advantages of Cooperative Education

***Combines Theory and Practice.*** By coordinating work experience with campus education, students integrate theory and practice and find greater relevance in their studies. Alternating between academic and industrial environments helps students to understand the role and meaning of each, with a deeper appreciation for both.

***Helps Finance Educational and Living Expenses.*** Students' earnings contribute substantially to financing their education and living expenses. Work assignments usually increase in difficulty and responsibility as students progress through the academic curriculum, and salaries increase accordingly.

***Serves as a Bridge to the Future.*** Cooperative education helps to orient students to the world of work, enabling them to learn more about the range of occupations open to them and the qualifications demanded. Cooperative education programs provide opportunities for students to explore their abilities in connection with real jobs and to gain firsthand information about the occupations in which they are employed and a number of related fields. They have a chance to test their aptitudes more fully than is normally possible on campus.

***Increases Motivation to Achieve.*** The coordination of work and study increases student motivation. As students see connections between jobs they hold and the things they are learning in school, they develop greater interest in academic work. Work assignments often help students to develop good work habits because their efforts are rated by the employer.

***Enhances Human Relationships.*** Because the work experiences often require constructive relationships with coworkers who come from a variety of backgrounds, most students in cooperative education develop deeper understanding of other people and greater skills in human relations.

***Develops Maturity.*** For many students the work experience contributes to an increased sense of responsibility for their own efforts, greater dependence on their own judgment, and a corresponding development of maturity.

## Why Employers Participate

Industry and government agencies have found that cooperative education students are valuable employees. Generally, they are alert and energetic young people who, stimulated by a definite goal, return more than a day's work for a day's pay. Graduates of the cooperative program represent a good source of well-trained personnel. The training period provides an opportunity for the employer to evaluate the student as a prospective permanent employee. At the same time, the student is able to evaluate the employer in terms of his or her interests and future plans. About half of the cooperative education graduates remain in permanent positions with their employers after graduation, giving them a substantial head start in their careers.

It is emphasized, however, that the employer is not obligated to offer permanent employment after graduation, nor is the student obliged to accept. Industry and government agencies consider participation in cooperative education to be a long-range investment, a joint effort with the University to develop students' talents more fully.

### *Responsibilities of the Cooperative Education Student*

The cooperative education student working with professionals in the field must adopt professional standards of conduct. Such a student is also a representative of the School of Engineering and Applied Science. After each work period the student prepares a report describing the duties and responsibilities at work, and the supervisor sends an appraisal of the student's performance to the Cooperative Education Program coordinator. These reports are reviewed with the student.

The cooperative program is a three-way partnership among the student, the employer, and George Washington University. The student's responsibilities extend equally to each of the other two members of the partnership, and the partnership cannot be altered during the program without the knowledge and consent of all.

The cooperative education student must maintain continuous enrollment in the School for each semester he or she is on a work period. Failure to do so breaks the student's registration, and he or she must apply for readmission to the undergraduate degree program under whatever conditions and regulations are in force at that time.

### *Scholastic Requirements*

Students entering the program must be in good academic standing and usually must have completed at least two semesters of college-level academic study prior to their first full-time work assignment. To remain in the program, the student must maintain a passing average and perform satisfactorily for the employer.

### *Living Accommodations*

Arrangements are made for students in the Cooperative Education Program to retain their dormitory and dining privileges at the University, if they so desire, during the work periods. During this time, they also retain full student privileges and have access to all University facilities.

### *Work–Study Schedules*

Student schedules are arranged individually with employers in Washington and other areas, since each employer operates differently. The schedule must be mutually satisfactory to the student, the employer, and the School.

Generally, the schedule is arranged after the student has successfully completed the first year of study. Many employers will require the student to work during the summer immediately following the freshman year. The student returns to the School for the sophomore year, working again during the second summer. In the third and fourth years, students alternate between employer and classroom each semester, returning to the classroom for the fifth and final year. An alternate method is to work a full academic year and then return to school. Schedules for transfer students are arranged on an individual

basis according to the number of semester hours transferred and the employer's requirements.

### *Tuition Aid*

Under the Tuition Aid Program, certain employers grant up to 50 percent of the cost of tuition, textbooks, and fees (excluding room and board). A student who receives tuition assistance must agree to serve as an employee after graduation for a period to be determined by regulations in force at that time.

The cooperative education student who is a civil service employee is eligible for many federal benefits, including annual leave, sick leave, paid holidays, health benefits, and life insurance.

### *Applications*

Applications for the Cooperative Education Program from registered or transfer students should be submitted at least 10 weeks prior to the beginning of the first work period. It is recommended, however, that applications be submitted four months in advance of the work period. Transfer students who meet admission requirements may apply for work assignments during the summer or the semester just prior to their registration at this University.

## Honors Research Program

To provide individualized research experience to academically gifted undergraduate students, the School of Engineering and Applied Science has established an Honors Research Program. A student who maintains a grade-point average of 3.3 or above or is admitted to the School with a combined SAT score of 1250 and a rank in the upper 10 percent of his or her high school class is eligible for this program. Participants attend an honors research seminar and each works individually with a faculty member, performing a research project of mutual interest. Participation in the program earns 3 academic credits per semester; a minimum of 9 credits is needed to complete the program. Upon written request by the student, 6 of these credits may be used as technical electives.

In the honors seminar, students present the results of their research projects and discuss techniques applicable to research in many disciplines, as well as conditions and trends that influence the performance and application of research in universities, industry, and government laboratories. The projects, which emphasize original research, typically involve literature surveys, analytical and numerical studies, and the planning and execution of experiments. Students are expected to prepare written and oral reports on their research.

Qualified students interested in applying for the program should contact the honors research chairman of the department in which the research is to be conducted.

## Naval Reserve Officers Training Corps Program*

The Naval Reserve Officers Training Corps (NROTC) offers young men and women the opportunity to qualify for a full scholarship and a commission in the Navy or Marine Corps. NROTC midshipmen are required to complete the

* For Army and Air Force ROTC program information, see page 237.

naval science courses and attend weekly laboratory sessions. During the summer, NROTC midshipmen participate in active duty at sea or on shore-based training cruises for approximately four weeks. Upon receiving the baccalaureate and completing the NROTC program, qualified midshipmen are commissioned as ensigns in the Navy or second lieutenants in the Marine Corps. Students may join the NROTC through any one of the following four programs.

***Four-Year Scholarship Program.*** Students enter the NROTC Four-Year Scholarship Program through national competition and are appointed midshipmen in the Naval Reserve. While students are enrolled, the government provides tuition, fees, books, uniforms, and an allowance of $100 per month. Upon graduation, students are commissioned with an eight-year active/reserve service obligation and will serve on active duty for at least four years. Students must include courses in English, calculus, computer science, physics, national security policy, a foreign language, technical electives, and naval science in their degree programs and participate in three summer training periods of approximately four weeks each.

***Two-Year Scholarship Program.*** Selection for this program is made through national competition, based on the student's academic record, physical qualifications, and an interview. Application should be made by the start of the fall semester of the student's sophomore year. Selected applicants attend six weeks of instruction at the Naval Science Institute (NSI) at Newport, Rhode Island, during the summer before their third academic year. At NSI, students take courses in naval science, physical fitness, and drill, similar to those required of four-year NROTC students during their freshman and sophomore years. Successful completion of the NSI qualifies the two-year applicants for appointment as midshipmen in the Naval Reserve and enrollment in the NROTC Scholarship Program. Upon acceptance of this appointment, students receive all the benefits and assume all the obligations of midshipmen in the Four-Year Scholarship Program.

***Four-Year College Program.*** Students are enrolled in the Four-Year College Program upon acceptance by the Department of Naval Science. Uniforms are provided, and during their junior and senior years, students receive $100 per month. Students must include courses in mathematics, science, and naval science in their degree programs, attend the first class summer at-sea training period, accept a commission in the Naval Reserve or Marine Corps Reserve on graduation with an eight-year active/reserve service obligation, and serve on active duty after graduation for at least three years. After commissioning, application for transfer to the regular Navy or Marine Corps may be made. Midshipmen who complete one term as College Program students, have a satisfactory academic record, and are physically qualified may compete for a scholarship awarded by the Chief of Naval Education and Training. College Program students who demonstrate academic excellence may be nominated for NROTC Scholarships by the Professor of Naval Science. If awarded, the scholarship will be for the remainder of the student's undergraduate enrollment, up to a maximum of three and a half years; service requirements and benefits are the same as for the scholarship programs.

***Two-Year College Program.*** Application should be made by the start of the spring semester of the student's second year. Selections are made through the Department of Naval Science, based on the student's academic record, physical qualifications, and an interview. Those students selected will attend the NSI and upon successful completion may enroll in the program. The

benefits and obligations are the same as those for the Four-Year College Program.

***Requirements for All Candidates.*** Qualifications for acceptable candidates for the Scholarship Program or the College Program include U.S. citizenship, fulfillment of physical requirements, and willingness to participate in required summer training periods and to accept a commission in the Navy, Marine Corps, Naval Reserve, or Marine Corps Reserve when offered.

Enrollment in NROTC is not a requirement for taking naval science courses. Any student enrolled at George Washington University may take naval science courses with the approval of the Professor of Naval Science.

## *Naval Science Courses*

51 **Introduction to Naval Science** (3)
A general introduction to the naval profession and to concepts of sea power. The mission, organization, and warfare components of the U.S. Navy and Marine Corps. Overview of officer and enlisted ranks and rates, training and education, and career patterns. Naval courtesy and customs, military justice, leadership, and nomenclature. Professional competencies required to become a naval officer.

52 **Naval Ships Systems I (Engineering)** (3)
A detailed study of ship characteristics and types, including ship design and control, propulsion, hydrodynamic forces, stability, compartmentation, electrical and auxiliary systems, interior communication, and damage control. Included are basic concepts of the theory and design of steam, gas turbine, and nuclear propulsion. Shipboard safety and firefighting.

125 **Naval Ships Systems II (Weapons)** (3)
Theory and employment of weapons systems, including the processes of detection, evaluation, threat analysis, weapon selection, delivery, guidance, and explosives. Fire control systems and major weapons types, including capabilities and limitations. Physical aspects of radar and underwater sound. Facets of command, control, and communications as means of weapons system integration.

126 **Sea Power and Maritime Affairs** (3)
A survey of U.S. naval history, from the American Revolution to the present, with emphasis on major developments. The geopolitical theory of Mahan. Present-day concerns in sea power and maritime affairs, including the economic and political issues of merchant marine commerce, the law of the sea, the Russian navy and merchant marine, and a comparison of U.S. and Soviet naval strategies.

150 **Navigation and Naval Operations I** (3)
An in-depth study of piloting and celestial navigation, including theory, principles, and procedures. Students develop practical skills in both piloting and celestial navigation. The use of charts, visual and electronic aids, and the theory and operation of magnetic and gyro compasses. The celestial coordinate system; spherical trigonometry, theory and operation of the sextant, and a step-by-step treatment of the sight-reduction process. Other topics include tides, currents, effects of wind and weather, plotting, use of navigation instruments, types and characteristics of electronic navigation systems, and a day's work in navigation.

151 **Navigation and Naval Operations II** (3)
A study of the international and inland rules of the nautical road, relative-motion vector-analysis theory, relative motion problems, formation tactics, and ship employment. Introduction to naval operations and operations analysis, ship behavior and characteristics in maneuvering, applied aspects of ship handling, and afloat communications.

160 **Evolution of Warfare** (3)
This course traces the development of warfare, from the dawn of recorded history to the present, with focus on the impact of major military theorists, strategists, tacticians, and technological developments. The student acquires a basic sense of strategy, develops an understanding of military alternatives, and sees the impact of historical precedent on military thought and actions.

175 **Leadership and Management I** (3)
A comprehensive study of organizational behavior and management in the context of naval organization. Survey of the management functions of planning, organizing, and controlling. Introduction to individual and group behavior in organizations and extensive study of motivation and leadership. Major behavioral theories. Practical applications are explored by the use of experiential exercises, case studies, and laboratory discussions. Other topics include decision making, communication, responsibility, authority, and accountability.

176 **Leadership and Management II** (3)
A survey of the interaction of leadership, organizational behavior, and human resource management. Employee interviewing and counseling, performance appraisals, business correspondence, military and civilian law, and managerial ethics and values. This capstone course in the naval science curriculum builds on and integrates professional competencies to develop a thorough understanding of the problems and issues faced by leaders, managers, and naval officers.

180 **Amphibious Warfare** (3)
A historical survey of the development of amphibious doctrine and the conduct of amphibious operations. The evolution of amphibious warfare in the 20th century, especially during World War II. Present-day potential and limitations on amphibious operations, including the rapid deployment force concept.

## *Naval Science Course Credit*

Students enrolled in undergraduate degree programs in the School of Engineering and Applied Science are eligible to receive technical elective credit for the successful completion of certain naval science courses.

Civil Engineering, Computer Science, and Mechanical Engineering majors—
NSc 52: Naval Ships Systems I
NSc 150: Navigation and Naval Operations I
NSc 175: Leadership and Management I

Electrical Engineering majors—
NSc 52: Naval Ships Systems I
NSc 150: Navigation and Naval Operations I

Systems Analysis and Engineering majors—
NSc 52: Naval Ships Systems I
NSc 125: Naval Ships Systems II
NSc 150: Navigation and Naval Operations I
NSc 151: Navigation and Naval Operations II

Social science credit may be received for the successful completion of the following naval science courses. (See the *Undergraduate and Graduate Programs Bulletin* for further information.)
NSc 126: Sea Power and Maritime Affairs
NSc 160: Evolution of Warfare
NSc 180: Amphibious Warfare

## Secondary Fields of Study

A program of secondary fields of study has been established within the University to provide opportunities for formal inter-school study. Students must be in good academic standing in the school in which they are enrolled to be eligible to take a secondary field in another school. The secondary fields consist of 12 to 30 hours of prescribed courses, depending on the field, with scholarship requirements determined by the school offering the field. Upon satisfactory completion of all requirements, the title of the secondary field of study and the courses taken in support of the field are entered on the student's transcript.

Students enrolled in degree programs in the School of Engineering and Applied Science may not take secondary fields within SEAS. For information on the secondary fields offered by other schools, which are open to SEAS students, please see the program brochure available in the SEAS Admissions Office. Because the undergraduate engineering degree programs are highly structured, SEAS students are cautioned to consult their adviser and department chair before enrolling in a secondary field of study.

## 3:2 Dual-Degree Programs Combining Liberal Arts and Engineering

The School of Engineering and Applied Science has developed 3:2 dual-degree programs in liberal arts and engineering with the following accredited institutions:

Bowie State College, Bowie, Md.
Chestnut Hill College, Philadelphia, Pa.
Gallaudet University, Washington, D.C.
Georgian Court College, Lakewood, N.J.
Hood College, Frederick, Md.
Mansfield State University, Mansfield, Pa.
St. Joseph College, Hartford, Conn.
St. Mary's College of Maryland, St. Mary's City, Md.
St. Thomas Aquinas College, Sparkhill, N.Y.
Southeastern College, Athens, Greece
Virginia Commonwealth University, Richmond, Va.
Wheaton College, Norton, Mass.

Students initially enroll in the 3:2 dual-degree program at one of the above institutions and pursue a three-year course of studies covering social sciences, humanities, mathematics, physics, and chemistry, which helps the student develop broad cultural perspectives, analytic abilities, and communication skills. Students then follow a two-year career program in engineering at the School of Engineering and Applied Science. During this phase of study, students may specialize in any of the following areas of engineering offered in the School's regular four-year programs:

1. Civil engineering
2. Computer science with one of the following application elective tracks: computer-aided design, digital electronics and hardware, engineering administration, financial systems, management decision systems,

management information systems, mathematics, and operations research
3. Electrical engineering or electrical engineering with an option in computer engineering or premedical engineering
4. Mechanical engineering with one of the following options: computer-aided design, energy and power, fluid mechanics and thermal sciences, mechanical engineering design, and solid mechanics and materials engineering
5. Systems analysis and engineering with one of the following elective tracks: computer systems, control and instrumentation systems, electrical energy systems, electromechanical systems, environmental systems, financial systems, management decision systems, mathematical systems, mechanical energy systems, network systems, naval systems, production systems, and statistical systems

Upon successful completion of the two-year engineering program at George Washington University, students are awarded two baccalaureate degrees: a B.S. or B.A. from the first institution and a B.S. in engineering or computer science from GWU. Program graduates may choose to enter engineering practice, continue studies for advanced degrees, or enter other professional areas, such as law, medicine, or teaching.

Students in a dual-degree program are eligible to apply for the Cooperative Education Program in Engineering at George Washington University. The student transferring to GWU is considered to have completed the equivalent of the first two years of the engineering curriculum. Thus the student would have the option of working during the summer and starting classes in the fall or working for a full eight months prior to starting classes. Those interested in applying for cooperative education at GWU should submit the appropriate application forms six months prior to actual transfer.

For further information on the 3:2 dual-degree programs, contact the admissions offices of the institutions listed above.



## Administration

Harold Liebowitz, D.Ae.E., *Dean of the School of Engineering and Applied Science; Codirector, Joint Institute for Advancement of Flight Sciences; Director, Institute for the Study of Fatigue, Fracture, and Structural Reliability; Director, Institute for Technology and Strategic Research*
James Elmer Feir, Ph.D., *Associate Dean of the School of Engineering and Applied Science*
James David Foley, Ph.D., *Chair of the Department of Electrical Engineering and Computer Science*
Raymond Richard Fox, M.S., *Chair of the Department of Civil, Mechanical, and Environmental Engineering*
Donald Gross, Ph.D., *Chair of the Department of Operations Research*
Ali Muhlis Kiper, Ph.D., *Mechanical Engineering Curriculum Chair, Department of Civil, Mechanical, and Environmental Engineering*
Robert Charles Waters, D.B.A., *Chair of the Department of Engineering Administration*
Robert Mayer Allman, M.D., *Codirector, Institute for Medical Imaging and Image Analysis*
Walter Kurt Kahn, D.E.E., *Director, Institute for Information Science and Technology*
Murray Howard Loew, Ph.D., *Codirector, Institute for Medical Imaging and Image Analysis*
Khalid Mahmood, Ph.D., *Director, International Water Resources Institute*
William Henry Marlow, Ph.D., *Director, Institute for Management Science and Engineering*
Barry George Silverman, Ph.D., *Director, Institute for Artificial Intelligence*
Nozer Darabsha Singpurwalla, Ph.D., *Director, Institute for Reliability and Risk Analysis*
Edward Teller, Ph.D., *Honorary Director, Institute for Technology and Strategic Research*
Richard Walker Barnwell, Ph.D., *Chief Scientist, NASA–Langley Research Center; Director, Joint Institute for Advancement of Flight Sciences*
Malcolm P. Clark, M.S., *Administrator, NASA–Langley Graduate Program*
John Lindsey Whitesides, Jr., Ph.D., *Associate Director and Director of Research, Joint Institute for Advancement of Flight Sciences*
George W.M. Brown, M.A., *Manager, Engineering Admissions and Cooperative Education Program*
Margaret Mary Hansen, B.A., *School Administrator*
Graham Wilson McIntyre, M.S., *Director, Research and Resources Office*
J.W. Perkins, B.S., *Director, Continuing Engineering Education Program*
Michael Paul White, B.A., *Manager, SEAS Computing Facility*

## Dean's Council

Harold Liebowitz *(Chairman)*, S.Y. Berkovich, R.R. Fox, C.A. Garris

## Advisory Council

The purposes of the Advisory Council for the School of Engineering and Applied Science are to strengthen communication between the School and the other colleges, schools, and divisions of the University as well as between the School and the University's Board of Trustees; to advise on the programs of instruction, research, and service in the School and to help interpret these programs to the larger community; and to generate support for the continued development of the School and its programs.

### Members of the Council for 1988–89*

*Chairman:* L. Stanley Crane *(University Trustee), Chairman and Chief Executive Officer, Consolidated Rail Corporation*
Bruno A. Boley, *Professor of Civil Engineering and Engineering Mechanics, Columbia University*
J.P. Chambers, *Consultant, E-Systems, Inc.*
Joseph M. Fox, *Chairman, Software Architecture and Engineering, Inc.*
Moses Freedman, *Washington, D.C.*
Eugene G. Fubini, *President, E.G. Fubini Consultants, Limited*
William J. Harris, Jr., *E. B. Snead Distinguished Professor of Transportation Engineering, Texas Transportation Institute, Texas A&M*
Alexander Hassan, *Washington, D.C.*
Walter R. Hibbard, Jr., *Professor, Virginia Polytechnic Institute and State University*
William Holt, *Consultant*
William H. Marlow, *Professor, Department of Operations Research*
Bernard A. Schriever, General USAF (Ret.), *Management Consultant, Schriever & McKee Associates, Inc.*
Wayne G. Shaffer, *Consultant, Vitro Laboratories*
Edward G. Uhl, *Trappe, Maryland*
Ernst Weber, *President Emeritus, Polytechnic Institute of New York*
Harold A. Wheeler, *Chief Scientist and Chairman Emeritus, Hazeltine Corporation*
L.A. Zadeh, *Professor of Electrical Engineering and Computer Sciences, University of California, Berkeley*

*The President of the University, the Vice President for Academic Affairs, and the Dean of the School of Engineering and Applied Science are *ex officio* members of the Advisory Council.



# Programs of Study and Courses of Instruction

Programs of study, curricula, and courses of instruction offered by the School of Engineering and Applied Science are described in this section.

Students who are not candidates for degrees but who wish to take courses offered by the School should apply for admission to the Division of Continuing Education.

## Explanation of Course Numbers

Courses numbered 1–200 are planned for undergraduate students, although certain courses may be taken for graduate credit when approved in advance by the instructor and the dean. Courses numbered 201–300 are planned for graduate students and may in certain instances be taken by qualified undergraduate students. Courses numbered 301–400 are primarily for doctoral students.

## Semester Hours of Credit

The number of semester hours of credit given for the satisfactory completion of a course is indicated in parentheses after the name of the course. A year-long course giving three hours of credit each semester is marked (3–3) and a semester course giving three hours of credit is marked (3). A semester hour may be defined as one 50-minute period of class work or one laboratory period a week for one semester.

## Time of Course Offerings

Following each course description is a parenthetical statement listing the semester for which the course is scheduled. The term *academic year* is used only with two-semester courses and indicates that the first half of the course is to be offered in the fall semester and the second half in the spring semester. Summer sessions offerings are generally not designated in this *Bulletin*. Students should consult the *Summer Sessions Announcement* for summer offerings. A *Schedule of Classes* is published each semester to provide information concerning the time of course offerings.

## Computer Usage Fee

A computer usage fee is charged for those courses that use the computer facilities of the University. Applicable fees are listed in the *Schedule of Classes* for each semester. The maximum computer usage fee is $100 for any semester.

## Key to Abbreviations

The following abbreviations are used for course designations.

| | |
|---|---|
| Accy | Accountancy |
| AdSc | Administrative Sciences |
| AHA | Allied Health Administration |
| AM | Association Management |
| AmCv | American Civilization |
| Anat | Anatomy |
| Anes | Anesthesiology |
| Anth | Anthropology |
| ApSc | Applied Science |
| Art | Art |
| ArTh | Art Therapy |
| BAd | Business Administration |
| Bioc | Biochemistry |
| BiSc | Biological Sciences |
| Cart | Cartography |
| CE | Civil Engineering |
| CH&D | Child Health and Development |
| Chem | Chemistry |
| Chin | Chinese |
| Clas | Classics |
| ClEn | Clinical Engineering |
| Cnsl | Counseling |
| Comm | Communication |
| CpMd | Computer Medicine |
| CSci | Computer Science |
| Derm | Dermatology |
| EAd | Engineering Administration |
| Econ | Economics |
| Educ | Educational Leadership |
| EE | Electrical Engineering |
| EFL | English as a Foreign Language |
| EMed | Emergency Medicine |
| Engl | English |
| EngS | Engineering Science |
| EnHe | Environmental Health |
| Envr | Environmental Studies |
| EPol | Education Policy |
| E&RP | Environmental and Resource Policy |
| ExSA | Exercise and Sport Activities |
| ForS | Forensic Sciences |
| Fren | French |
| Geog | Geography and Regional Science |
| Geol | Geology |
| Ger | Germanic Languages and Literatures |
| Gern | Gerontology |
| Gnet | Genetics |
| HCS | Health Care Sciences |
| Hist | History |
| HmKn | Human Kinetics |
| Hmn | Humanities |
| HmSr | Human Services |
| HRD | Human Resource Development |
| HSA | Health Services Administration |
| IAff | International Affairs |
| Idis | Interdisciplinary Courses |
| Ital | Italian |
| Japn | Japanese |
| Jour | Journalism |
| Kor | Korean |
| Law | Law |
| LEnf | Law Enforcement |
| Libr | Library |
| Math | Mathematics |
| ME | Mechanical Engineering |
| Med | Medicine |
| Mgt | Management Science |
| Micr | Microbiology |
| MStd | Museum Studies |
| Mus | Music |
| Neur | Neurology |
| NSc | Naval Science |
| NSur | Neurological Surgery |
| Ob&G | Obstetrics and Gynecology |
| Opht | Ophthalmology |
| OR | Operations Research |
| Orth | Orthopedic Surgery |
| PAd | Public Administration |
| Path | Pathology |
| Pchi | Psychiatry and Behavioral Sciences |
| PCm | Political Communications |
| PH | Public Health |
| Phar | Pharmacology |
| Phil | Philosophy |
| Phyl | Physiology |
| Phys | Physics |
| Port | Portuguese |
| PPol | Public Policy |
| PSc | Political Science |
| Psyc | Psychology |
| Rad | Radiology |
| Rel | Religion |
| Rmn | Romanian |
| Rom | Romance Literatures |
| RSci | Radiological Sciences |
| Slav | Slavic Languages and Literatures |
| SLP | Service Learning Program |
| Soc | Sociology |
| Span | Spanish |
| SpEd | Special Education |
| SpHr | Speech and Hearing |
| Stat | Statistics/Computer and Information Systems |
| Surg | Surgery |
| TCom | Telecommunications Policy |
| TrDa | Theatre and Dance |
| TrEd | Teacher Education |
| T&T | Travel and Tourism |
| Univ | University |
| Urol | Urology |
| U&RP | Urban and Regional Planning |
| WStu | Women's Studies |

# Applied Science

Interdepartmental offerings.

## Undergraduate Courses

57 **Analytical Mechanics I** (2)
First half of a one-year sequence. Concepts of statics: force systems, conditions of force and moment equilibrium, simple structures, distributed forces, centroids, internal forces, friction, moments of inertia. Prerequisite or concurrent registration: ApSc 113, Phys 14. (Fall and Spring)

58 **Analytical Mechanics II** (3)
Second half of a one-year sequence. Concepts of dynamics: kinematics of particles, velocity and acceleration, translating and rotating reference frames, particle dynamics, motion under central and electromagnetic force, effect of Earth's rotation, vibrations, work, kinetic and potential energy, dynamics of systems of particles. Prerequisite: ApSc 57. (Fall and Spring)

113 **Engineering Analysis I** (3)
Analytical methods appropriate to the solution of engineering problems: applications of ordinary differential equations, matrices and determinants, eigenvalues and eigenvectors, systems of ordinary linear differential equations, Bessel and Legendre functions. Prerequisite or concurrent registration: Math 33. (Fall and Spring)

114 **Engineering Analysis II** (3)
Analytical methods appropriate to the solution of engineering problems: complex variables, Fourier series and integral, orthogonal functions, Laplace transforms, partial differential equations in engineering and applied science. Prerequisite: ApSc 113. (Fall and Spring)

115 **Engineering Analysis III** (3)
Analytical methods appropriate to the solution of engineering problems using concepts from probability and statistics: random variables, distribution functions, mathematical expectation, point and confidence interval estimation, hypothesis testing, correlation, regression, and engineering applications. Prerequisite: Math 32 or OR 130. (Fall, Spring, and Summer)

116 **Engineering Analysis IV** (3)
Analytical methods appropriate to the solution of engineering problems using advanced concepts from probability and statistics: multivariate distributions, expectation, generating functions, parametric families of distributions, sampling and sufficient statistics, estimation, hypothesis testing, and engineering applications. Prerequisite: ApSc 115, Math 33. (Fall and Spring)

190 **Honors Research Project and Seminar** (3)
Student designs and carries out a research project under close supervision of a faculty adviser. Students from all engineering disciplines meet periodically to present projects and discuss results. Enrollment limited to students admitted to the Undergraduate Honors Research Program. May be repeated for credit.

## Graduate Courses

211 **Analytical Methods in Engineering I** (3)
Engineering applications of the theory of complex variables: contour integration, conformal mapping, inversion integral, and boundary-value problems. Prerequisite: approval of department. (Fall and Spring)

212 **Analytical Methods in Engineering II** (3)
Analytical methods appropriate to the formulation of engineering problems: finite dimensional vector spaces, eigenvalue problems, generalized Fourier series, tensor calculus, curvilinear coordinates. Prerequisite: approval of department. (Fall)

213 **Analytical Methods in Engineering III** (3)
Analytical techniques for solution of boundary–initial-value problems in engineering: wave propagation, diffusion processes, and potential distributions. Prerequisite: approval of department. (Fall and Spring)

214 **Analytical Methods in Engineering IV** (3)
Introduction to variational methods in engineering: Ritz and Galerkin approximation methods of boundary-value problems, aspects of linear integral equations arising from engineering analysis. Prerequisite: approval of department. (Spring, odd years)

215 **Analytical Methods in Engineering V** (3)
Advanced methods of solution of boundary–initial-value problems in engineering: characteristics, wave propagation, and Green's functions. Prerequisite: ApSc 213. (Fall, odd years)

216 **Special Topics in Engineering Analysis** (3)
Selected topics, such as perturbation techniques applied to approximate solution of nonlinear boundary and initial-value problems in engineering; application of singular integral equations in problems of mechanics; applications of elements of functional analysis in engineering and science. Prerequisite: approval of department. (Spring, even years)




SAM NOW


Civil,
Mechanical,
and Environmental
Engineering









# Civil, Mechanical, and Environmental Engineering

***Professors*** G.M. Arkilic, R.R. Fox *(Chair)*, H. Liebowitz, J.E. Feir, T.G. Toridis, J. Eftis, A.K. Noor, R. Goulard, K. Mahmood, A.M. Kiper, M.K. Myers, J.-N Yang, R.E. Kaufman, D.M. Esterling, C.M. Gilmore, J.L. Whitesides, T.P.G Liverman, V. Klein, D.L. Jones, B.M. Kramer, C.A. Garris

***Adjunct Professors*** W.P. Reid, M.P. Gaus, B.W. Hannah, B. Whang, D.D Moran, M.O. Critchfield, A.G. Adamantiades, M. Yachnis

***Professorial Lecturers*** N.L. Basdekas, D.R. Levin, W.D. Erickson, G.D. Love, S.-C. Liu, T.-F. Zien, D.J. Michel, W.D. Jackson, H.H. Landon, B. Miller, E.F. Skelton, C.J. Astill, W.H. Huang, P.D. Maycock, J.C. Hardin, R.H Tolson, J. Sobieski, D.U. Gubser, J.I. Bregman, E. McCafferty, R.C. Macon, H.S. Gill, P.S. Lam, E.C. Yates, Jr., C. Ng, W.J. Boettinger, G.C. Everstine, J.A. Sprague, R.W. Barnwell, D.L. Dwoyer, F. Farassat, C.G. Interrante, A Kehnemui, T. Kusuda, C.F. Scheffey, C.R. Hauer

***Associate Professors*** M.I. Haque, E.T. Moyer, Jr.

***Adjunct Associate Professors*** B. Dendrou, M.A. Imam

***Associate Professorial Lecturers*** J.C. Yu, D.W. Ellison, R.Y.-Y. Ting, P.L. Coe, Jr., M.C. Cullingford, F.L. Willingham, Jr., D.W. Coder, A.B. Wardlow, Jr., C.J. Jachimowski, M.M. Mikulas, Jr., J.C. Coolbaugh, K. Khozeimeh, L.D. Pinson, R.L. Bowles, W.D. Burrows, V. Mukhopadhyay, C. Winklehaus, R.F. Jones, Jr., S.C. Mehrotra, D.R. Mulville, S. Basu, I.S. Raju, R. Chung, S.M. Joshi, R.E. Lindberg, Jr., T.A. Zang, Jr., S.L. Zimmerman, C.C. Frantz, A. Ghamarian

***Assistant Professor*** S. Sarkani

***Assistant Professorial Lecturers*** R.C. Montgomery, J.N. Shoosmith, G.D Walberg, R. Lee, H.L. Beach, Jr., K. Sutton, T.L. Walton, Jr., M.Y. Hussaini, G.E. Hicho, J.F. O'Dea, M.P. Gottlieb, W. Kulyk, J.N. Moss, L.W. Townsend, E.T. Von Briesen, N.F. Knight, Jr., J.M. Luckring, K.G. Garrahan, A.L. Dinsenbacher, H. Biswas, A.A. Oni, N.S. Sivakumaran, S.H. Yang

## Civil Engineering Undergraduate Study

Civil engineering encompasses those branches of engineering most closely related to the control and improvement of our environment and of the physical conditions of life. Study in this field prepares students for careers in the planning, design, and construction of buildings, bridges, roads, airports, rapid transportation systems, harbors, off-shore facilities, coastal protection structures, flood- and pollution-control systems for rivers and lakes, inland navigation systems, large power-generation and flood-control dams, water resources projects, urban renewal and development programs, and pollution-control and waste-disposal projects. It also provides the scientific and technological background required for careers in municipal engineering, urban and regional planning, environmental and geotechnical civil engineering, and research in structural mechanics, ocean engineering, and materials engineering.

The curriculum equips the student to begin a career upon graduation, to register as a professional civil engineer as required by law, and to pursue graduate study.

## Part-Time Study

To accommodate individuals employed full time in the Washington, D.C., area who wish to obtain the Bachelor of Science (Civil Engineering) degree, evening and late afternoon classes are scheduled on a regular basis. A part-time student who enrolls for three courses a semester, for example, may expect to complete B.S. degree requirements within 15 semesters.

## Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

### *First Semester*

CSci 51: Introduction to Computing (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Math 31: Single-Variable Calculus I (3)
Phys 13: General Physics for Engineering and Applied Science (3)
Elective: Selected from humanities or social sciences (3)

### *Second Semester*

Chem 13: General Chemistry (4)
EngS 4: Engineering Drawing and Computer Graphics (3)
Math 32: Single-Variable Calculus II (3)
Phys 14: Mechanics and Thermal Physics (3)
Elective: Selected from humanities or social sciences (3)

### *Third Semester*

ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
ApSc 115: Engineering Analysis III (3)
Math 33: Multivariable Calculus (3)
Phys 15: Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

### *Fourth Semester*

ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
CE 120: Introduction to the Mechanics of Solids (3)
CE 140: Materials Science (3)
Phys 16: Modern Physics (3)
Elective: Selected from humanities or social sciences (3)

## Civil Engineering Curriculum

### *Fifth Semester*

CE 117: Engineering Computations (3)
CE 121: Structural Theory I (3)
CE 166: Materials Engineering (2)
CE 167: Mechanics of Materials Laboratory (1)
ME 126: Fluid Mechanics (3)
ME 131: Thermodynamics (3)

### Sixth Semester

CE 122: Structural Theory II (3)
CE 192: Reinforced Concrete Structures (3)
CE 193: Hydraulics (3)
Engl 110: Writing in Engineering and the Sciences (3)
Geol 136: Introduction to Engineering Geology (3)
Elective: Selected from humanities or social sciences (3)

### Seventh Semester

CE 168: Introductory Soil Mechanics (3)
CE 190: Contracts and Specifications (2)
CE 191: Metal Structures (3)
CE 194: Environmental Engineering I: Water Supply and Resources (3)
CE 195: Hydrology (3)
Elective: Technical elective (3)

### Eighth Semester

CE 182: Foundation Engineering (2)
CE 185: Soil Mechanics and Foundation Engineering Laboratory (1)
CE 196: Design and Cost Analysis of Civil Engineering Structures (3)
CE 197: Environmental Engineering II: Waste and Pollution Control (3)
Elective: Technical electives (8)*

### Technical Electives

ApSc 199: Honors Research Project and Seminar (3)
CE 198: Research (3)
CE 201: Design of Metal Structures (3)
CE 202: Design of Reinforced Concrete Structures (3)
CE 203: Prestressed Concrete Structures (3)
CE 204: Applied Soil Mechanics I (3)
CE 206: Geotechnical Engineering (3)
CE 208: Rock Engineering (3)
CE 210: Methods of Structural Analysis (3)
CE 212: Open Channel Flow (3)
CE 213: Hydraulic Structures (3)
CE 214: Design of Dams (3)
CE 215: Urban Construction Technology (3)
CE 216: Advanced Hydrology (3)
CE 220: Urban Transportation Engineering (3)
CE 222: Stations and Terminals (3)
CE 223: Traffic Engineering (3)
CE 240: Principles of Environmental Engineering I (3)
CE 241: Principles of Environmental Engineering II (3)
CE 243: Environmental Impact Assessment (3)
CE 253: Failure and Reliability Analysis of Engineering Structures (3)
CE 255: Introduction to Ocean and Coastal Engineering (3)
CE 266: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I (3)
CE 282: Hydraulic Modeling (3)

*EAd 160 *Introduction to Engineering Economic Analysis* is strongly recommended as a technical elective.

EAd 160: Introduction to Engineering Economic Analysis (3)
EngS 215: Advanced Strength of Materials (3)
EngS 231: Structure of Materials (3)
EngS 234: Composite Materials (3)
EngS 237: Environmental Effects on Materials (3)
EngS 241: Failure of Materials (3)
EngS 242: Materials Recycling and Recovery (3)
EngS 282: Computer-Aided Design (3)
EngS 284: Numerical Methods in Engineering (3)

## Civil Engineering Undergraduate Courses

117 **Engineering Computations** (3)
Application of numerical methods to the solution of engineering problems. Reduction of physical and engineering systems to computer models. Optimization techniques, physical modeling. Emphasis on use of small-scale computing systems. Prerequisite: CSci 51 and junior status. (Fall)

120 **Introduction to the Mechanics of Solids** (3)
Stress and strain, axial load problems, torsion, shear force and bending moment, pure bending of beams, shearing stresses in beams, compound stresses, analysis of plane stress and plane strain, combined stresses, deflection of beams, statically indeterminate problems, columns, the energy methods. Prerequisite: ApSc 57, 113. (Fall and Spring)

121–22 **Structural Theory I–II** (3–3)
Theory of determinate and indeterminate structures using both classical and modern approaches. Prerequisite or concurrent registration: CE 120. (Fall and Spring)

140 **Materials Science** (3)
Electron structure of atoms; atomic and molecular bonding; energy bands; crystal structure; imperfections; noncrystalline solids; reaction rates; diffusion; phase transformations, mechanical properties, electrical conduction; metals, insulators, semiconductors; magnetism; optical properties. Prerequisite: Chem 13; concurrent registration: Phys 16. (Fall and Spring)

166 **Materials Engineering** (2)
Mechanical properties, plastic deformation dislocation theory, yielding, strengthening mechanisms, microstructure and properties, heat treatment of steel, composites, amorphous materials, viscoelastic deformation, creep, fracture, fatigue, fatigue crack propagation. Prerequisite: CE 140; concurrent registration: CE 120. (Fall and Spring)

167 **Mechanics of Materials Laboratory** (1)
Measurement of strains and study of failure resulting from applied forces in ductile, brittle, anisotropic, elastomeric, plastic, and composite materials. Study of tension, compression, bending, impact, and shear failures. Prerequisite or concurrent registration: CE 166. (Fall and Spring)

168 **Introductory Soil Mechanics** (3)
Engineering properties of soils; analysis of lateral earth pressures, bearing capacity, foundations, and slope stability. Prerequisite: CE 120, ME 126. (Fall)

182 **Foundation Engineering** (2)
Subsurface exploration, design of shallow foundations, design of pile foundations, earth-retaining structures, professional ethics applications. Prerequisite: CE 168. (Spring)

185 **Soil Mechanics and Foundation Engineering Laboratory** (1)
Laboratory experiments for the classification, strength, compressibility, and general engineering properties of soils. Prerequisite: CE 168. (Spring)

190 **Contracts and Specifications** (2)
Law of contracts, construction contracts, specifications, bidding, insurance and bonds, professional liability, arbitration of disputes, litigation. (Fall)

191 **Metal Structures** (3)
Principles of the design of metal structures, structural elements, connections, specific problems of analysis, methods of construction, professionalism in design. Prerequisite: CE 122. (Fall)

192 **Reinforced Concrete Structures** (3)
Principles of the design of reinforced concrete structures. Details of reinforcement of structural elements. Monolithic structures, precast elements, methods of construction. Prerequisite: CE 121; or concurrent registration: CE 122. (Spring)

193 **Hydraulics** (3)
Fluid statics: applications to calculation of boundary forces in a static fluid, buoyancy, and flotation. Application of kinematic principles; flow fields, stream tubes, and flow nets. Fluid dynamics: applications to pipe flow, hydraulic models, measurement of pressure, and velocity. Open channel flow: applications to water resources engineering. Prerequisite: ME 126. (Spring)

194 **Environmental Engineering I: Water Supply and Resources** (3)
Planning and design of water supply and waste-water disposal systems. Water quality control and treatment processes. Desalination, stream pollution control. Prerequisite or concurrent registration: CE 193. (Fall)

195 **Hydrology** (3)
Descriptive hydrology: hydrologic cycle, precipitation, stream flow, evaporation, and transpiration. Quantitative hydrology: hydrograph analysis, estimating volume of runoff, runoff from snow, hydrographs of basin outflow, storage routing. Probability concepts in hydrology: flood frequency, rainfall frequency, drought, stochastic hydrology. Prerequisite or concurrent registration: ApSc 115, ME 126, CE 193. (Fall)

196 **Design and Cost Analysis of Civil Engineering Structures** (3)
Total structural systems concepts. Design of civil engineering structures such as piers, wharves, bulkheads, offshore platforms, dams, and other special structures. Principles of cost analysis for timber, steel, and reinforced concrete structures. Prerequisite: senior status. (Spring)

197 **Environmental Engineering II: Waste and Pollution Control** (3)
Disposal of sewage, biological treatment, chemical treatment, filtration, activated sludge, sludge handling and disposal. Control of industrial wastes and of nuclear waste products. Solid waste disposal. Prerequisite: CE 193. (Spring)

198 **Research** (1 to 3)
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

## Mechanical Engineering Undergraduate Study

Mechanical engineering is primarily concerned with physical systems in motion—with the conversion, transfer, and control of energy from its source to its moving system. Mechanical engineers are involved in work with, for example, land and marine vehicles, transportation systems, air-conditioning systems, nuclear reactors and fuel cells, pollution-control devices, synthetic fuels, and energy resources and practical means of converting various forms of energy to mechanical and electrical power. Training in this area should provide the ability to formulate problems based on fundamental laws of

nature, to recognize the methods applicable to their solution, to read with understanding the relevant work, and to come up with usable answers.

The curriculum in mechanical engineering begins with a foundation in physics, chemistry, mathematics, humanities, and social sciences and progresses to studies in basic mechanics of solids and fluids, electricity and electronics, materials sciences, dynamic analysis, thermal sciences, energy conversion and power, environmental control, and the design and control of machines and systems. Computer applications in mechanical engineering are an integral part of many courses. These applications include computer-aided drafting, analysis of mechanical system components, optimization of mechanical engineering systems, and laboratory data collection and reduction. Technical electives in the senior year permit students to select from a range of specialty options, including computer-aided design, energy and power, fluid mechanics and thermal sciences, mechanical engineering design, and solid mechanics and materials engineering.

Graduates of the mechanical engineering curriculum are qualified for professional positions in analysis, research and development, computer-aided design, and manufacturing and for graduate study and research in a variety of fields.

## Part-Time Study

To accommodate individuals employed full time in the Washington, D.C., area who wish to obtain the Bachelor of Science (Mechanical Engineering) degree, late afternoon and evening classes are scheduled on a regular basis. A part-time student who enrolls for three courses a semester, for example, may expect to complete B.S. degree requirements within 15 semesters.

## Junior Year Abroad Program

The School of Engineering and Applied Science and the Institute of Sound and Vibration Research of the University of Southampton, England, have established an exchange program so that graduate students in acoustics at both institutions may transfer academic credits to either University in fulfillment of degree requirements. This exchange program has been extended to the undergraduate level, enabling some mechanical engineering students to spend the junior year abroad.

The program furthers a student's particular academic interests in mechanical engineering and develops knowledge of world affairs in general and international technical fields in particular.

Students must apply for admission to the Junior Year Abroad Program to the department chair before the end of the fall semester of the sophomore year. Approval must be given by the department chair and the dean of the School of Engineering and Applied Science.

## Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

### *First Semester*

CSci 51: Introduction to Computing (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Math 31: Single-Variable Calculus I (3)*
Phys 13: General Physics for Engineering and Applied Science (3)
Elective: Selected from humanities or social sciences (3)

### *Second Semester*

Chem 13: General Chemistry (4)
EngS 4: Engineering Drawing and Computer Graphics (3)
Math 32: Single-Variable Calculus II (3)
Phys 14: Mechanics and Thermal Physics (3)
Elective: Selected from humanities or social sciences (3)

### *Third Semester*

ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
ApSc 115: Engineering Analysis III (3)
Math 33: Multivariable Calculus (3)
Phys 15: Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

### *Fourth Semester*

ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
CE 140: Materials Science (3)
EE 11: Linear Networks I (3)
Phys 16: Modern Physics (3)
Elective: Selected from humanities or social sciences (3)

## Mechanical Engineering Curriculum

### *Fifth Semester*

CE 120: Introduction to the Mechanics of Solids (3)
CE 166: Materials Engineering (2)
CE 167: Mechanics of Materials Laboratory (1)
ME 117: Engineering Computations (3)
ME 131: Thermodynamics (3)
ME 134: Introduction to Vibration Analysis (3)

*Transfer students who have not successfully completed a college-level calculus course with a grade of *C* or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour math placement test at registration. This test covers algebra, trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test may be required to take Math 3, 6, or 30 to make up the deficiency.

### Sixth Semester

EE 20: Introductory Engineering Electronics (3)
Engl 110: Writing in Engineering and the Sciences (3)
ME 120: Methods of Engineering Experimentation (2)
ME 126: Fluid Mechanics I (3)
ME 148: Thermodynamic Systems (3)
ME 191: Mechanical Design (3)

### Seventh Semester

ME 187: Heat Transfer (3)
ME 190: Analysis and Synthesis of Mechanisms (3)
ME 193: Engineering Systems Design (3)
Elective: Technical electives (6)

### Eighth Semester

ME 152: Mechanical Engineering Laboratory (2)
ME 182: Electromechanical Control System Design (3)
ME 195: Computer-Aided Design of Mechanical Systems (2)
ME 196: Design Project (1)
Elective: Technical electives (6)
Elective: Selected from humanities or social sciences (3)

## Mechanical Engineering Options

A minimum of 12 semester hours of technical electives must be taken in one of the following options. Alternative elective programs or individual course substitutions may be approved upon written request by the student to his or her adviser and the department. An asterisk indicates that the course is required for that option.

### Computer-Aided Design

ApSc 199: Honors Research Project and Seminar (3)
CSci 147: Assembly Language Programming I (3)
CSci 150: Introduction to Microcomputers (3)
CSci 153: Design of Switching Systems (3)
CSci 157: Assembly Language Programming II (3)
CSci 158: Algorithmic Methods (3)
EngS 282: Computer-Aided Design (3)
EngS 283: Application of Computer Graphics in Engineering (3)
EngS 284: Numerical Methods in Engineering (3)
EngS 285: Finite Element Methods in Engineering Mechanics (3)
*ME 192: Manufacturing Processes and Systems (3)
*ME 197: Robotic System Design and Applications (3)
ME 198: Research (3)

### Energy and Power

ApSc 199: Honors Research Project and Seminar (3)
EngS 208: Energy Conservation (3)
*ME 155: Fluid Mechanics II (3)
ME 198: Research (3)
ME 257: Energy Systems Analysis I (3)

ME 258: Energy Systems Analysis II (3)
ME 259: Solar Heating Systems (3)
ME 260: Heating and Air-Conditioning of Buildings (3)
ME 291: Power Systems I (3)
ME 292: Power Systems II (3)

### *Fluid Mechanics and Thermal Sciences*

ApSc 199: Honors Research Project and Seminar (3)
EngS 218: Introduction to Continuum Mechanics (3)
*ME 155: Fluid Mechanics II (3)
ME 198: Research (3)
ME 221: Intermediate Fluid Mechanics (3)
ME 231: Hydrodynamics (3)
ME 237: Propulsion (3)
ME 280: Intermediate Thermodynamics (3)
ME 288: Convective Heat and Mass Transfer (3)
ME 289: Radiative Heat Transfer (3)

### *Mechanical Engineering Design*

ApSc 199: Honors Research Project and Seminar (3)
EngS 215: Advanced Strength of Materials (3)
EngS 257: Theory of Vibrations (3)
EngS 284: Numerical Methods in Engineering (3)
EngS 285: Finite Element Methods in Engineering Mechanics (3)
*ME 192: Product Design and Process Engineering (3)
ME 198: Research (3)
ME 240: Kinematic Synthesis (3)
ME 241: Computer Models of Physical and Engineering Systems (3)
ME 242: Advanced Mechanisms (3)
ME 243: Advanced Mechanical Engineering Design (3)

### *Solid Mechanics and Materials Engineering*

ApSc 199: Honors Research Project and Seminar (3)
EngS 215: Advanced Strength of Materials (3)
*EngS 218: Introduction to Continuum Mechanics (3)
EngS 221: Theory of Elasticity I (3)
EngS 231: Structure of Materials (3)
EngS 233: Mechanics of Composite Materials (3)
EngS 234: Composite Materials (3)
EngS 237: Environmental Effects on Materials (3)
EngS 241: Failure of Materials (3)
EngS 285: Finite Element Methods in Engineering Mechanics (3)
ME 198: Research (3)
Phys 170: Elementary Solid-State Physics (3)

## Mechanical Engineering Undergraduate Courses

117 **Engineering Computations** (3)
Application of numerical methods to the solution of engineering problems. Reduction of physical and engineering systems to computer models. Optimization techniques, physical modeling, numerical methods, and problem-solving techniques. Emphasis on use of small-scale computing systems. Prerequisite: CSci 51 and junior status. (Fall)

120 **Methods of Engineering Experimentation** (2)
Acquisition and analysis of experimental data. Laws of modeling and simulation. Report formulation and presentation. Basic principles of measuring instruments and sensors. Fundamentals of digital data acquisition and use of computer-based data systems. Laboratory experiments including the use of strain gages, oscilloscopes, transducers, and computerized data systems. Prerequisite: ME 117. (Spring)

126 **Fluid Mechanics I** (3)
Fluid properties, fluid statics, integral and differential formulations of conservation of mass, momentum, and energy. Bernoulli's equation. Dimensional analysis and similitude. Inviscid flow. Viscous flow. Experimental and computational methods in fluid mechanics. Prerequisite: ApSc 58. (Spring)

131 **Thermodynamics** (3)
Fundamental thermodynamic concepts, Zeroth law of thermodynamics and temperature measurements, work and heat, first law of thermodynamics, properties of pure substances, first-law analysis of some thermodynamic systems, second law of thermodynamics, reversibility, entropy, second-law analysis of thermodynamic systems. Prerequisite: Phys 14, ApSc 113. (Fall)

134 **Introduction to Vibration Analysis** (3)
Natural frequencies, free vibration, forced vibration. Unbalance, whirling, vibration isolation. Measuring techniques and application of computers in vibration analysis. Multiple degrees of freedom. Dynamic vibration absorbers. Shock and transient vibration. Prerequisite: ApSc 58. (Fall)

148 **Thermodynamic Systems** (3)
Second-law analysis of thermodynamic systems. Mixtures of gases and vapors, properties of air–water vapor mixtures, psychrometry and its application in some engineering processes. Power from two-phase systems, Rankine cycle and engine, improving the thermal efficiency of Rankine engines, reheat and regeneration. Gas turbine, Brayton and regenerative cycles. Internal combustion engines, Otto and diesel cycles. Thermodynamic analysis of reactive systems. Prerequisite: ME 131. (Spring)

152 **Mechanical Engineering Laboratory** (2)
Project-oriented course. Simulates working environment of professional engineers. Projects are assigned in student's areas of interest; student is expected to design and assemble own experiments. Extensive use of instrumentation and computing facilities. Project proposal, progress reports, final report, and periodic oral presentations required. Prerequisite: ME 120. (Spring)

155 **Fluid Mechanics II** (3)
Potential flow theory: stream and potential functions, Laplace's equation, superposition of elementary flows. D'Alembert's paradox. Boundary-layer theory: von Kármán momentum integral method. Drag on immersed bodies: form drag and skin friction for streamlined and bluff bodies in laminar and turbulent flow. Turbulence: Prandtl mixing length, eddy viscosity, and transport phenomena. Compressible flow: acoustic speed, Mach number, isentropic flow, nozzle flow and flow around airfoils and turbine blades, normal and oblique shock phenomena, Raleigh and Fanno flows. Experimental and computational methods in fluid mechanics. Prerequisite: ME 126, 131. (Fall)

182 **Electromechanical Control System Design** (3)
Application of control theory to the design of electromechanical systems. Characteristics of transducers, valves, and other control components. Mathematical models of open- and closed-loop electromechanical systems. Root locus and frequency response methods; application to the synthesis of feedback systems by both manual and computer-aided techniques. Prerequisite: ApSc 114; ME 117, 134. (Spring)

187 **Heat Transfer** (3)
Heat transfer processes. General heat conduction equations; steady- and unsteady-state heat conduction problems. Methods of analysis; analytical, analog, and numerical solution methods. Fundamentals of convective heat transfer. Evaluation of convective-heat-transfer coefficients; dimensional analysis, boundary-layer approach, analogy between heat and momentum transfer. Energy exchange by thermal radiation; fundamental concepts and laws, radiation properties, radiative heat transfer between surfaces. Design considerations: heat-exchanger design and selection. Prerequisite: senior status. (Fall)

190 **Analysis and Synthesis of Mechanisms** (3)
Kinematics and dynamics of mechanisms. Displacements, velocities, and accelerations in linkage, cam, and gear systems by analytical, graphical, and computer methods. Synthesis of linkages to meet prescribed performance requirements. Prerequisite: ApSc 58. (Fall)

191 **Mechanical Design** (3)
Integration of knowledge of strength of materials in a design context. Stresses and deflections in engineering structures. Theories of failure. Introduction to the design of mechanical components, such as fasteners, shafts, springs. Introduction to the use of computers in mechanical engineering design. Prerequisite: CE 120, ME 117. (Spring)

192 **Manufacturing Processes and Systems** (3)
Introduction to modern manufacturing techniques for metals, polymers, ceramics, and composite materials. Relationships between properties of materials and techniques for processing them. Process selection, design, control, and integration. Computer-integrated manufacturing, robotic applications, and assembly automation. Prerequisite: junior status or permission of instructor. (Spring)

193 **Engineering Systems Design** (3)
Creative engineering design, problem definition, and concept generation. Design of and familiarization with bearings, clutches, brakes, and couplings. Optimization of system design using computers and design projects. Graphical communication, project presentation, and use of existing design resources. Prerequisite: ME 191. (Fall)

194 **Energy Conversion** (3)
Energy sources and utilization, principal fuels for energy conversion. Production of thermal energy, conversion of chemical energy, fossil fuel systems. Energy conservation and environmental considerations in energy conversion and use. Production of electrical energy, fundamental principles, technological options, longer-range possibilities. Energy management and economic considerations. Prerequisite: EE 20, ME 148. (Spring)

195 **Computer-Aided Design of Mechanical Systems** (2)
Presentation of the major elements in a computer-aided design system, including interactive computer graphics, database management, and interactive analysis methods, such as the finite element method. Design of systems involving a variety of constraints. Consideration of economic, safety, and reliability factors in the design process. Prerequisite: ME 193; concurrent registration: ME 196. (Spring)

196 **Design Project** (1)
Identification and preparation of a design project, including problem formulation, feasibility studies and preliminary design, prototype development and testing, and design optimization. Concurrent registration: ME 195. (Spring)

197 **Robotic System Design and Applications** (3)
Modeling and analysis of robot designs. Kinematics, statics, and dynamics of mechanical linkages. Design and analysis of mechanical structures, actuators, transmissions, and sensors. Robot control system design, programming, and vision systems. Current industrial applications and limitations of robotic

systems. Includes laboratory experiments. Prerequisite: junior status or permission of instructor. (Fall)

198 **Research** (1 to 3)
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

## Engineering Science Undergraduate Course

4 **Engineering Drawing and Computer Graphics** (3)
Introduction to technical drawing, including use of instruments, lettering, geometric construction sketching, and orthographic projection. Section and auxiliary views, dimensioning, isometric projection, intersections, and developments. Introductory computer graphics, including orthographic and isometric projection techniques and computer-aided drafting.
(Fall and Spring)

## Graduate Study

The Department of Civil, Mechanical, and Environmental Engineering offers graduate programs in various areas of concentration, leading to the Master of Science, the professional, and the Doctor of Science degrees.

The Doctor of Science degree is offered in the following areas: aeroacoustics, aeronautics, astronautics, computer-integrated design and manufacturing, energy, environmental engineering, fluid mechanics and thermal sciences, solid mechanics and materials science, structural engineering, structures and dynamics, and water resources (except the water resources planning option, which is for the M.S. degree only).

The Master of Science and the professional degrees are offered in all of the above areas and in the following: civil engineering, computer-aided design, geotechnical engineering, mechanical engineering design, and ocean and marine engineering (M.S. degree only).

Courses for these specializations are listed on the following pages. As part of the interdisciplinary program, students elect approved courses from other departments of the School of Engineering and Applied Science and from other schools and divisions of the University. Some of the programs leading to the Master of Science and, by special permission of the department chair, Doctor of Science degrees are offered at the NASA–Langley Research Center, Hampton, Virginia. NASA–Langley's extensive scientific and engineering facilities are used whenever possible.

Each program is designed to fit the student's needs, interests, and background. This background should normally include an undergraduate degree in engineering, the physical sciences, or applied mathematics. Each student is assigned a faculty adviser on the basis of study interests with whom he or she will work closely during the course of the program. Graduate areas of concentration and faculty advisers are listed below.

***Aeroacoustics***—Myers, Whitesides
***Aeronautics***—Goulard, Myers, Noor, Whitesides
***Astronautics***—Goulard, Myers, Noor, Whitesides
***Civil Engineering***—Fox
***Computer-Aided Design***—Esterling, Jones, Kaufman, Kramer, Toridis, Yang
***Computer-Integrated Design and Manufacturing***—Esterling, Jones, Kaufman, Kramer
***Energy***—Garris, Goulard, Kiper

***Environmental Engineering***—Fox
***Fluid Mechanics and Thermal Sciences***—Garris, Goulard, Kiper, Myers
***Geotechnical Engineering***—Fox
***Mechanical Engineering Design***—Jones, Kaufman, Kramer
***Solid Mechanics and Materials Science***—Arkilic, Eftis, Esterling, Gilmore, Jones, Moyer, Yang
***Structural Engineering***—Fox, Sarkani, Toridis, Yang
***Structures and Dynamics***—Arkilic, Noor, Sarkani, Toridis, Yang
***Water Resources Engineering***—Haque, Mahmood

## Admission Requirements

The applicant must be recommended for admission by the chair of the Department of Civil, Mechanical, and Environmental Engineering. For the Master of Science degree program, a grade average of *B* for the last two years of undergraduate study will normally be required; for the professional degree program, a quality-point index of at least 3.0 (on a 4.0 scale) in course work leading to the master's degree will normally be required; and for the Doctor of Science degree program, a quality-point index of at least 3.4 (on a 4.0 scale) in course work leading to the master's degree will normally be required.

## Computer Requirements

Because the use of computers has become an integral part of both education and research, each student entering graduate study in the Department of Civil, Mechanical, and Environmental Engineering should be familiar with the use of computers. The ability to use computers will be assumed in graduate courses.

## Language Requirement for Doctoral Program

No foreign language is required for the Doctor of Science degree program. A proficiency in one computer programming language, however, must be demonstrated to the doctoral adviser.

## Fields of Concentration

Programs of study in any field of concentration will generally include courses from appropriate allied areas.

*In this section, an asterisk indicates that a course or program is offered at NASA–Langley Research Center but may be offered on campus when arranged.*

### *Aeroacoustics**

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
EngS 217: Analytical Mechanics
EngS 257: Theory of Vibrations
EngS 270: Theoretical Acoustics I
*EngS 271: Random Process Theory I
*EngS 272: Random Process Theory II

*EngS 273: Time Series Analysis
EngS 274: Environmental Noise Control
*EngS 275: Theoretical Acoustics II
*EngS 276: Acoustical and Mechanical Measurements
*EngS 277: Physical Acoustics
*EngS 278: Psychological and Physiological Acoustics
*EngS 279: Human Factors in Engineering
*EngS 280: Special Topics in Acoustics
EngS 298: Research
EngS 299–300: Thesis Research
*EngS 310: Aeroacoustics
*EngS 311: Nonlinear Acoustics
*EngS 312: Theory of Random Vibration
*EngS 313: Structural Acoustics Interaction
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 216: Structural Dynamics
ME 221: Intermediate Fluid Mechanics
ME 312: Theory of Turbulence

Required courses for M.S. degree: ApSc 211, 213; EngS 270, 274 or 276; ME 221.
Required courses for the professional and doctoral degrees are established by the advisory committee in consultation with the student.

## Aeronautics*

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
EE 202: Linear Systems Theory
EngS 217: Analytical Mechanics
EngS 257: Theory of Vibrations
EngS 284: Numerical Methods in Engineering
*ME 201: Computational Fluid Dynamics Laboratory
*ME 202: Computational Aerodynamics Laboratory
*ME 203: Experimental Techniques in Aerodynamics
*ME 208: Research in Computational Fluid Dynamics
ME 221: Intermediate Fluid Mechanics
ME 222: Applied Aerodynamics
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 233: Aeroelasticity I
ME 234: Aeroelasticity II
ME 235: Compressible Flow
ME 237: Propulsion
*ME 247: Seminar: Aircraft Design I
*ME 248: Seminar: Aircraft Design II
*ME 270: Aerodynamics of Flight Vehicles
*ME 271: VTOL Aircraft Technology
*ME 272: Powered-Lift Technology
*ME 273: Principles of Automatic Flight Control
*ME 274: Principles of Flight Guidance
ME 275: Stability and Control of Vehicles
ME 276: Mechanics of Space Flight
ME 277: Computational Fluid Dynamics
*ME 279: Special Topics in Flight Sciences

ME 281: Advanced Thermodynamics
*ME 290: Kinetic Theory of Gases
ME 295: Statistical Thermodynamics
ME 298: Research
ME 299–300: Thesis Research
ME 312: Theory of Turbulence
ME 315: Hypersonic Flow
ME 398: Advanced Reading and Research
ME 399: Dissertation Research

Required courses for M.S. degree: ApSc 211, 213; ME 221, 275.
Required courses for the professional and doctoral degrees are established by the advisory committee in consultation with the student.

### *Astronautics**

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
EE 271: Linear Multivariable Control Theory
EE 272: Computer Control Systems
EE 273: Systems Optimization
EE 274: Nonlinear Systems
EE 277: Satellite Communications Systems
EE 278: Spacecraft Systems Design
EngS 217: Analytical Mechanics
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Enginering Mechanics
*EngS 286: Analysis and Design of Thin-Walled Structures
*EngS 287: Automated Design of Complex Structures
EngS 314: Advanced Numerical Methods
ME 221: Intermediate Fluid Mechanics
ME 235: Compressible Flow
ME 237: Propulsion
ME 238: Energetics of Fluid Flow
*ME 249: Spacecraft Design
*ME 250: Launch Vehicle Design
*ME 273: Principles of Automatic Flight Control
*ME 276: Mechanics of Space Flight
ME 280: Intermediate Thermodynamics
ME 287: Heat Conduction
ME 288: Convective Heat and Mass Transfer
*ME 290: Kinetic Theory of Gases
ME 298: Research
ME 299–300: Thesis Research
ME 315: Hypersonic Flow
ME 398: Advanced Reading and Research
ME 399: Dissertation Research

Required courses for M.S. degree: ApSc 211, 213; ME 221, 276.

### *Civil Engineering†*

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III

†A minimum of seven courses must be taken in the CMEE department to meet the degree requirements.

ApSc 214: Analytical Methods in Engineering IV
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Geotechnical Engineering
CE 208: Rock Engineering
CE 210: Methods of Structural Analysis
CE 211: Environmental Chemistry
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 215: Urban Construction Technology
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 220: Urban Transportation Engineering
CE 221: Pavement and Runway Design
CE 223: Traffic Engineering
CE 240: Principles of Environmental Engineering I
CE 241: Principles of Environmental Engineering II
CE 242: Solid Waste Disposal
CE 243: Environmental Impact Assessment
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 253: Reliability Analysis of Engineering Structures
CE 255: Introduction to Ocean and Coastal Engineering
CE 256: Coastal Processes
CE 257: Harbor and Coastal Engineering
CE 258: Application of Probability Methods in Civil Engineering
CE 276: Water Resources Planning and Control
CE 298: Research
CE 299–300: Thesis Research
EAd 204: Administration of Engineering Contracts
EAd 210: Engineering Law
EAd 242: Construction Management II
EAd 243: Construction Management III
EAd 261: Economic Analysis in Engineering Planning
EAd 265: Transportation Management I
EAd 266: Transportation Management II
EngS 228: Physical Oceanography
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 398: Advanced Reading and Research
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 231: Hydrodynamics
ME 255–56: Urban Transportation Technology
OR 201: Survey of Operations Research: Deterministic Models
OR 231: Theory of Traffic Flow
[1]PAd 242: Administration of State and Local Governments
[1]PAd 249: Urban Public Policy
[1]PAd 252: Public Expenditure Analysis and Planning

***Ocean and Coastal Engineering Option***
Required courses for M.S. degree: ApSc 211 or 213 or EngS 284; CE 212, 213, 240, 255.

[1]For course description, see the *Undergraduate and Graduate Programs Bulletin*.

***Public Works Engineering Option***[†]
Required courses for M.S. degree: CE 202, 206, 213, 240; EngS 285.
For professional degree: CE 241 or 223 or 276; EngS 284 or OR 201; EAd 242 or 243.

***Transportation Engineering Option***[†]
Required courses for M.S. degree: CE 202, 206, 213, 240; EngS 285.

## Computer-Aided Design

ApSc 213: Analytical Methods in Engineering III
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 210: Methods of Structural Analysis
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
CE 266: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I
CE 267: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II
CSci 147: Assembly Language Programming I
CSci 157: Assembly Language Programming II
CSci 158: Algorithmic Methods
CSci 159: Programming and Data Structures
CSci 161: Discrete Structures for Computing
CSci 201: Introduction to Computer Systems
CSci 212: Discrete Analysis in Computer Science
CSci 215: Advanced Data Structures
CSci 216: Information Retrieval Systems
CSci 219: Interactive Computer Graphics I
CSci 222: Design of User–Computer Dialogues
CSci 224: Artificial Intelligence
CSci 227: Management Information Systems and Database Management
CSci 258: Advanced Programming Languages
CSci 281: Numerical Solutions of Algebraic Systems
EngS 257: Theory of Vibrations
EngS 282: Computer-Aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
ME 216: Structural Dynamics
ME 218: Design of Floating and Submerged Marine Vehicles
ME 237: Propulsion
ME 238: Energetics of Fluid Flow
ME 240: Kinematic Synthesis
ME 241: Computer Models of Physical and Engineering Systems
ME 242: Advanced Mechanisms
ME 243: Advanced Mechanical Engineering Design
ME 246: Electromechanical Control Systems

Required courses for M.S. degree: ApSc 213; CSci 159, 201; EngS 282 or ME 243; EngS 284; CSci 219 or EngS 283. In place of CSci 201, CSci 157 or 147 and 158 may be taken.
For professional degree: CE 203, 250 or 251, 254 or EngS 257; CSci 216, 227.

[†]A minimum of seven courses must be taken in the CMEE department to meet the degree requirements.

## Computer-Integrated Design and Manufacturing

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
CSci 159: Programming and Data Structures
CSci 201: Introduction to Computer Systems
CSci 215: Advanced Data Structures
CSci 219: Interactive Computer Graphics II
CSci 224: Artificial Intelligence
CSci 226: Robotics
CSci 319: Interactive Computer Graphics III
EAd 217: Fundamentals of Artificial Intelligence
EAd 253: Production Management
EAd 262: Finance for Engineers
EAd 270: Cooperating Expert Systems
EngS 215: Advanced Strength of Materials
EngS 221: Theory of Elasticity I
EngS 241: Failure of Materials
EngS 257: Theory of Vibrations
EngS 282: Computer-Aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 314: Advanced Numerical Methods
ME 240: Kinematic Synthesis
ME 241: Computer Models of Physical and Engineering Systems
ME 242: Advanced Mechanisms
ME 243: Advanced Mechanical Engineering Design
ME 246: Electromechanical Control Systems
ME 286: Special Topics in Mechanical Engineering
ME 251: Computer-Integrated Manufacturing
ME 252: Projects in Computer-Integrated Design and Manufacturing
ME 299–300: Thesis Research
ME 398: Advanced Reading and Research
ME 399: Dissertation Research
OR 275: Introduction to Scheduling
OR 279: Inventory Control

Required courses for M.S. degree: ME 240, 241, 243, 246, 251.
For professional degree: EAd 270; EngS 283; ME 241, 252; OR 275.
For D.Sc. degree: ApSc 212, 213; EAd 217 or CSci 224; EngS 285; ME 252.
Since computer-integrated design and manufacturing encompasses a broad range of subject matter, special elective programs in other areas may be arranged.

## Energy

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 215: Analytical Methods in Engineering V
CE 243: Environmental Impact Assessment
EAd 221: Environmental Management
EAd 222: Energy Management
EngS 206: Technology and Human Needs
EngS 207: Engineering Climatology
EngS 208: Energy Conservation

EngS 210: Quantitative Aspects of Social Phenomena
EngS 212: Nonrenewable Resources
EngS 213: Renewable Resources
EngS 242: Materials Recycling and Recovery
EngS 270: Theoretical Acoustics I
EngS 274: Environmental Noise Control
EngS 284: Numerical Methods in Engineering
ME 204: Advanced Instrumentation Techniques
ME 221: Intermediate Fluid Mechanics
ME 224: Fundamentals of Combustion Engines
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 227: Viscous Flow
ME 235: Compressible Flow
ME 237: Propulsion
ME 257: Energy Systems Analysis I
ME 258: Energy Systems Analysis II
ME 259: Solar Heating Systems
ME 260: Heating and Air-Conditioning of Buildings
ME 261: Air Pollution I
ME 262: Air Pollution II
ME 264: Air Pollution Seminar
ME 267: Power Plant Pollution Control
ME 280: Intermediate Thermodynamics
ME 281: Advanced Thermodynamics
ME 283: Nuclear Reactor Engineering I
ME 284: Nuclear Reactor Engineering II
ME 287: Heat Conduction
ME 290: Kinetic Theory of Gases
ME 291–92: Power Systems
ME 293: Combustion
ME 298: Research
ME 299–300: Thesis Research
ME 312: Theory of Turbulence
ME 313: Magnetofluidmechanics
ME 398: Advanced Reading and Research
ME 399: Dissertation Research
OR 201: Survey of Operations Research: Deterministic Models

***Note:*** **All students are expected to have competency in the use of computers. Students who have not taken the required courses for the M.S. degree in the energy program at GWU may be required to take additional courses. M.S. candidates without research experience are encouraged to pursue the thesis option.**

***Energy Technology Option***
Required courses for M.S. degree: ApSc 213; ME 221, 257, 258, 280, 288; EngS 284
Students preparing for the comprehensive examination should be familiar with the material covered in EngS 218 and ME 237.
For professional degree: competency in the areas covered by the courses listed above and EngS 208, 284; ME 259, 260, 291, 292, 298 (6 credits).
For D.Sc. degree: competency in the areas covered by the courses listed above and ApSc 212, 215; ME 227 or 235 or 237, 281, 293. Students preparing for the qualifying examination should be familiar with the material covered in EngS 218 and ME 237.

***Energy Systems Option***
Required courses for M.S. degree: EngS 208, 284; ME 257, 258; OR 201.
For D.Sc. degree: competency in the areas covered by the courses listed above; EngS 210, 283; OR 251, 252; and additional requirements set by the doctoral advisory committee.

## Environmental Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
CE 211: Environmental Chemistry
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 237: Advanced Sanitary Engineering Design
CE 240: Principles of Environmental Engineering I
CE 241: Principles of Environmental Engineering II
CE 242: Solid Waste Disposal
CE 243: Environmental Impact Assessment
CE 255: Introduction to Ocean and Coastal Engineering
CE 272: Biological Wastewater Treatment
CE 273: Water-Supply Engineering
CE 276: Water Resources Planning and Control
CE 277: Industrial Waste Treatment
CE 278: Pollutant Transport
CE 283: Special Topics in Environmental Engineering
CE 298: Research
CE 299–300: Thesis Research
EngS 242: Materials Recycling and Recovery
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods
ME 261: Air Pollution I
ME 262: Air Pollution II
ME 267: Power Plant Pollution Control

Required courses for M.S. degree: CE 212, 213, 219, 240; ApSc 213 or CE 284.
For D.Sc. degree: ApSc 213; CE 237, 241, 272.

## Fluid Mechanics and Thermal Sciences

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 274: Mechanics of Water Waves
EE 133: Electromagnetic Waves and Microwave System Design
EE 236: Plasma Dynamics
EngS 218: Introduction to Continuum Mechanics
EngS 284: Numerical Methods in Engineering
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 315: Introduction to Nonlinear Mechanics of Continua
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 222: Applied Aerodynamics
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 233: Aeroelasticity I
ME 235: Compressible Flow

ME 237: Propulsion
ME 238: Energetics of Fluid Flow
ME 261: Air Pollution I
ME 277: Computational Fluid Dynamics
ME 280: Intermediate Thermodynamics
ME 281: Advanced Thermodynamics
ME 287: Heat Conduction
ME 288: Convective Heat and Mass Transfer
ME 289: Radiative Heat Transfer
ME 293: Combustion
ME 295: Statistical Thermodynamics
ME 297: Special Topics in Fluid Mechanics
ME 298: Research
ME 299–300: Thesis Research
ME 310: Mechanics of Non-Newtonian Fluids
ME 311: Nonsteady Flow
ME 312: Theory of Turbulence
ME 313: Magnetofluidmechanics
ME 315: Hypersonic Flow
ME 317: Physical Gas Dynamics
ME 398: Advanced Reading and Research
ME 399: Dissertation Research

Required courses for M.S. degree: ApSc 211, 213; ME 221, 280, 288 (also ME 227 for nonthesis students).
For professional and D.Sc. degrees: *Fluid Mechanics*—ApSc 212 or 214 or 216, 215; ME 231, 311, 312. *Thermal Sciences*—ApSc 212 or 214 or 216, 215; ME 235, 287, 289.

## *Geotechnical Engineering*

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Geotechnical Engineering
CE 207: Soil Dynamics
CE 208: Rock Engineering
CE 209: Probabilistic Methods in Geotechnical Engineering
CE 210: Methods of Structural Analysis
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 219: Groundwater and Seepage
CE 221: Pavement and Runway Design
CE 240: Principles of Environmental Engineering I
CE 255: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering
CE 258: Application of Probability Methods in Civil Engineering
CE 265: Special Topics in Geotechnical Engineering
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
EngS 221: Theory of Elasticity I
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics

†Geol 128: Geomorphology
†Geol 189: Geophysics for Geologists
†Geol 224: Advanced Structural Geology

Required courses for M.S. degree: CE 202, 206, 213, 240; EngS 285.
For professional degree: CE 207, 208, 209, 219; EngS 221.

## *Mechanical Engineering Design*

ApSc 213: Analytical Methods in Engineering III
CE 253: Failure and Reliability Analysis of Engineering Structures
EngS 215: Advanced Strength of Materials
EngS 257: Theory of Vibrations
EngS 259: Random Vibrations of Structures
EngS 282: Computer-Aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 240: Kinematic Synthesis
ME 241: Computer Models of Physical and Engineering Systems
ME 242: Advanced Mechanisms
ME 243: Advanced Mechanical Engineering Design
ME 246: Electromechanical Control Systems
ME 298: Research
ME 299–300: Thesis Research

Required courses for M.S. degree: ApSc 213 or EngS 284; ME 241, 243, 246.

## *Ocean and Marine Engineering‡*

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 210: Methods of Structural Analysis
CE 212: Open Channel Flow
CE 253: Reliability Analysis of Engineering Structures
CE 255: Introduction to Ocean and Coastal Engineering
CE 256: Coastal Processes
CE 257: Harbor and Coastal Engineering
†CE 271: Theoretical Marine Hydromechanics
†CE 275: Special Topics in Ocean Engineering
CE 298: Research
CE 299–300: Thesis Research
EngS 228: Physical Oceanography
EngS 257: Theory of Vibrations
EngS 260: Random Process Theory in Engineering

†For course description, see the *Undergraduate and Graduate Programs Bulletin*.
‡Program or course offered at DTNSRDC, Carderock, Md.

EngS 273: Time Series Analysis
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
ME 204: Advanced Instrumentation Techniques
†ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 277: Computational Fluid Dynamics
ME 280: Intermediate Thermodynamics
ME 297: Special Topics in Fluid Mechanics
ME 312: Theory of Turbulence

Required courses for M.S. degree: ApSc 211, 213; CE 210; ME 221, 280.

### *Solid Mechanics and Materials Science*

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 207: Soil Dynamics
CE 209: Probabilistic Methods in Geotechnical Engineering
CE 253: Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
EngS 215: Advanced Strength of Materials
EngS 217: Analytical Mechanics
EngS 218: Introduction to Continuum Mechanics
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II
EngS 229: Transformations in Materials
EngS 230: Deformation of Materials
EngS 231: Structure of Materials
EngS 233: Mechanics of Composite Materials
EngS 234: Composite Materials
EngS 236: Experimental Techniques in Materials Science
EngS 237: Environmental Effects on Materials
EngS 240: Fracture Mechanics
EngS 241: Failure of Materials
EngS 249: Special Topics in Materials Science
EngS 256: Plasticity
EngS 257: Theory of Vibrations
EngS 259: Random Vibration of Structures
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 298: Research
EngS 299–300: Thesis Research
EngS 315: Introduction to Nonlinear Mechanics of Continua
EngS 398: Advanced Reading and Research

†Program or course offered at DTNSRDC, Carderock, Md.

EngS 399: Dissertation Research
ME 216: Structural Dynamics
ME 221: Intermediate Fluid Mechanics
ME 280: Intermediate Thermodynamics
ME 281: Advanced Thermodynamics
ME 295: Statistical Thermodynamics
ME 310: Mechanics of Non-Newtonian Fluids
†BiSc 272: Scanning Electron Microscopy
†Chem 207: Chemical Bonding
†Chem 211–12: Physical Chemistry
†Chem 213: Chemical Thermodynamics
†Geol 113: Crystallography
†Phys 167: Principles of Quantum Physics
†Phys 168: Applied Quantum Physics
†Phys 170: Elementary Solid-State Physics
†Phys 211: Advanced Mechanics
†Phys 221–22: Quantum Mechanics
†Phys 224: Statistical Mechanics
†Phys 243: Solid-State Physics: Structure and Binding
†Phys 244: Solid-State Physics: Electronic Processes in Metals

***Solid Mechanics***
Required courses for M.S. degree: ApSc 211, 213; EngS 218, 231; ME 280.
For professional degree: EngS 222, 240, 241, 256, 285.
For D.Sc. degree: ApSc 212, 215; EngS 222, 230, 256, 315.

***Materials Science***
Required courses for M.S. degree: ApSc 211, 213; EngS 218, 231; ME 280.
For professional degree: EngS 234, 237, 240, 241.
For D.Sc. degree: ApSc 212; EngS 229, 230; ME 295.

## *Structural Engineering*

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Geotechnical Engineering
CE 207: Soil Dynamics
CE 208: Rock Engineering
CE 210: Methods of Structural Analysis
CE 215: Urban Construction Technology
CE 221: Pavement and Runway Design
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 253: Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 256: Coastal Processes
CE 257: Harbor and Coastal Engineering
CE 258: Application of Probability Methods in Civil Engineering

†For course description, see the *Undergraduate and Graduate Programs Bulletin*

CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
CE 266: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I
CE 267: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II
CE 298: Research
CE 299–300: Thesis Research
CE 398: Advanced Reading and Research
CE 399: Dissertation Research
EngS 215: Advanced Strength of Materials
EngS 218: Introduction to Continuum Mechanics
EngS 221: Theory of Elasticity I
EngS 233: Mechanics of Composite Materials
EngS 234: Composite Materials
EngS 240: Fracture Mechanics
EngS 241: Failure of Materials
EngS 256: Plasticity
EngS 257: Theory of Vibrations
EngS 259: Random Vibration of Structures
EngS 282: Computer-Aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics

Required courses for M.S. degree: CE 201 or 202, 206, 210; EngS 215, 285.
For professional degree: CE 250 or 251; EngS 257 or CE 253; CE 266 or 267; EngS 282 or 288.
For D.Sc. degree: ApSc 212, 213 or 214; EngS 257; CE 254 or EngS 259; EngS 221, 288.

### *Structures and Dynamics*

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
†CE 207: Soil Dynamics
†CE 210: Methods of Structural Analysis
CE 253: Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 258: Application of Probability Methods in Civil Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
†CE 266: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I
†CE 267: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II
†EngS 215: Advanced Strength of Materials
†EngS 217: Analytical Mechanics
†EngS 218: Introduction to Continuum Mechanics
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II

†Course offered on campus only.

†EngS 233: Mechanics of Composite Materials
EngS 234: Composite Materials
†EngS 240: Fracture Mechanics
†EngS 256: Plasticity
EngS 257: Theory of Vibrations
EngS 259: Random Vibration of Structures
‡EngS 281: Advanced Programming Techniques for Engineering Problems
EngS 282: Computer-Aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
‡EngS 286: Analysis and Design of Thin-Walled Structures
‡EngS 287: Automated Design of Complex Structures
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 299–300: Thesis Research
EngS 314: Advanced Numerical Methods
‡EngS 315: Introduction to Nonlinear Mechanics of Continua
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 216: Structural Dynamics
‡ME 233: Aeroelasticity I
‡ME 247: Seminar: Aircraft Design I
OR 251: Linear Programming
OR 252: Nonlinear Programming I

***Programs on Campus***
Required courses for M.S. degree: ApSc 213; CE 253 or 258, 261 or 263 or EngS 285; EngS 215, 257.
For D.Sc. degree: ApSc 212, 214 or 215; ME 216; EngS 221, 259.

***Programs at NASA–Langley Research Center***
Required courses for M.S. degree: ApSc 213; CE 261 or 263; EngS 221 or 234, 284, 285, 286 or 287.
For D.Sc. degree: ApSc 214; EngS 281, 288; ME 223.

## Water Resources

### *Water Resources Engineering Option*

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
CE 208: Rock Engineering
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 240: Principles of Environmental Engineering I
CE 243: Environmental Impact Assessment
CE 255: Introduction to Ocean and Coastal Engineering
CE 256: Coastal Processes

†Course offered on campus only.
‡Course offered at NASA–Langley Research Center only.

CE 273: Water-Supply Engineering
CE 274: Mechanics of Water Waves
CE 276: Water Resources Planning and Control
CE 278: Pollution Transport System
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 284: Numerical Methods in Water Resources
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
CE 312: Advanced Hydraulics
CE 398: Advanced Reading and Research
CE 399: Dissertation Research
EngS 260: Random Process Theory in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
ME 221: Intermediate Fluid Mechanics
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 277: Computational Fluid Dynamics
ME 312: Theory of Turbulence
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 273: Discrete Systems Simulation

Required courses for M.S. degree: *Thesis Option*—ApSc 213 or CE 284; CE 212, 213, 282. *Nonthesis Option*—ApSc 213 or CE 284; CE 212, 213, 219, 240.
For professional and D.Sc. degrees: ApSc 211, 213; CE 282, 312; ME 221.

### *Water Resources Planning Option*

ApSc 213: Analytical Methods in Engineering III
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 240: Principles of Environmental Engineering I
CE 242: Solid Waste Disposal
CE 243: Environmental Impact Assessment
CE 256: Coastal Processes
CE 273: Water-Supply Engineering
CE 276: Water Resources Planning and Control
CE 278: Pollution Transport System
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 284: Numerical Methods in Water Resources
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
EAd 211–12: Engineering Administration
EAd 269: Elements of Decision Making and Problem Solving
EAd 283: Systems Engineering I
EAd 284: Systems Engineering II
EngS 206: Technology and Human Needs
EngS 213: Renewable Resources
EngS 260: Random Process Theory in Engineering
EngS 284: Numerical Methods in Engineering

ME 221: Intermediate Fluid Mechanics
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 253: Integer and Network Programming
OR 271: Forecasting Techniques
OR 273: Discrete Systems Simulation
OR 377: Advanced Stochastic Models in Operations Research
†Econ 217–18: Survey of Economics
†Econ 235: Energy Resources and Policy
†Econ 237: Economics of the Environment and Natural Resources
†Geog 222: Seminar: Resources and the Environment
†Geog 223: Seminar: The Population–Food Balance
†PSc 222: Science, Technology, and Public Affairs

Required courses for M.S. degree: *Thesis Option*—ApSc 213 or CE 284; CE 212, 213, 276. *Nonthesis Option*—ApSc 213 or CE 284; CE 212, 213, 219, 240, 276, 280.

## Civil Engineering Graduate Courses

Courses designated "As arranged" are not offered on a regular basis.

201 **Design of Metal Structures** (3)
Structural behavior of metal structures, conception and design of advanced structural components and systems, hysteretic behavior, plastic design principles, box-type girders, cable systems, composite girders, and special topics. Prerequisite: CE 191 or equivalent. (Spring)

202 **Design of Reinforced Concrete Structures** (3)
Structural behavior of reinforced concrete structures, conception and design of structural components, prestressed concrete, slabs, ultimate strength and deformation, box-type girders, hysteretic behavior, safety considerations, and special topics. Prerequisite: CE 192 or equivalent. (Fall)

203 **Prestressed Concrete Structures** (3)
Structural behavior and failure modes of prestressed concrete structures; design in prestressed concrete, including long-span structures, bridges, and precast systems. Prerequisite: CE 192 or equivalent. (Spring)

204 **Applied Soil Mechanics I** (3)
Theories of soil strength; bearing capacity of shallow foundations and their design; deep foundations, including pile types and design criteria; theories of lateral earth pressure with applications; stability analyses of slopes. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of department. (Spring, even years)

205 **Applied Soil Mechanics II** (3)
Nature of soil, including geological and pedological aspects; flow of water in soil; seepage involving foundations, dams, and wells; stress distribution in earth masses; one- and three-dimensional theories of consolidation; analysis of settlement. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of department. (Fall, even years)

206 **Geotechnical Engineering** (3)
Principles of soil mechanics and structural mechanics applied to the analysis and design of spread footings and mat foundations, pile foundations, retaining structures, including sheeting and bracing systems, and waterfront structures. Problems associated with subsurface exploration, dewatering excavations, and underpinning. Prerequisite: approval of department. (Spring)

†For course description, see the *Undergraduate and Graduate Programs Bulletin*

207 **Soil Dynamics** (3)
Stress–strain behavior of soil under transient and repeated loads, effects of earthquakes on foundations and earth dams, design of machinery foundations. Prerequisite: CE 204. (Fall, odd years)

208 **Rock Engineering** (3)
Classification and properties of rock; nature of rock masses and rock discontinuities; field exploration; methods of excavation; design and applications to foundation slopes, tunnels, and chambers in rock. Prerequisite approval of department. (Fall, odd years)

209 **Probabilistic Methods in Geotechnical Engineering** (3)
Review of probability concepts; probabilistic theory for particulate media. variability of soil properties; applications of reliability analysis to geotechnical problems, such as shallow foundations and soil slopes; decision analysis in geotechnical engineering. (Fall, even years)

210 **Methods of Structural Analysis** (3)
Modern methods of analysis of statically indeterminate structures, matrix analysis based on flexibility, stiffness, energy and variational methods. substructuring techniques; consideration of plastic collapse of structures: introduction to the finite element method. Prerequisite: graduate status (Fall)

211 **Environmental Chemistry** (3)
Principles and laboratory operations in environmental chemistry, with primary emphasis on chemistry applicable to water supply, wastewater treatment, and hazardous waste management. Emphasis on advanced analytical techniques, including HPLC, GC, and AA. Prerequisite or concurrent registration: CE 240. (Fall, odd years)

212 **Open Channel Flow** (3)
Types and regimes of flow; energy and momentum principles, uniform flow gradually varied flow, spatially and rapidly varied flow. Flow in nonprismatic channels. Unsteady flow; dam break problem, flood routing. Prerequisite: CE 193 or ME 221. (Fall)

213 **Hydraulic Engineering** (3)
Principles and practice of hydraulic design of conveyance, regulating, and measurement structures. Design considerations for spillways, energy dissipators, inlet and outlet works related to dams. Forces acting on hydraulic structure and stability analysis. Selection and operation of hydraulic turbines and pumps. Design considerations for flow through pipes. Flow transients and cavitation. Prerequisite: CE 193 or approval of department (Spring)

214 **Design of Dams** (3)
Project planning and investigations. Types of dams; design of earth–rock fill dams; stability analysis, foundation treatment, wind–wave protection. Construction methods for dams. Reservoir sedimentation. Safety inspection of dams. Prerequisite: CE 193 or graduate status. (Spring, even years)

215 **Urban Construction Technology** (3)
Precedents and contemporary trends in urban housing, building, and planning technology. Prerequisite: approval of department. (As arranged)

216 **Advanced Hydrology** (3)
Precipitation, evaporation, and transpiration. Soil physics; stream flow, drainage basins, hydrograph analysis, and stream-flow routing. Design criteria, flood frequency statistics and analysis, flood forecasting and control. water-supply forecasting. Prerequisite: CE 195 or equivalent.
(Spring, even years)

219 **Groundwater and Seepage** (3)
Permeability theory of groundwater flow, flow nets, analogs, computer solutions; applications to engineering problems such as excavation dewatering, flow through dams, stabilization of earth slopes. Prerequisite: approval of department. (Spring)

220 **Urban Transportation Engineering** (3)
Introduction to urban transportation planning. Analysis of urban transportation requirements. Evaluation procedure for selecting among alternative solutions. Prerequisite: approval of department. (Fall, odd years)

221 **Pavement and Runway Design** (3)
Pavement types, wheel-load characteristics; stresses in pavements and subgrades; empirical methods of design of flexible and rigid highway and airfield pavements; general principles of runway design. Prerequisite: CE 202, 204 or 205. (Spring, odd years)

222 **Stations and Terminals** (3)
Unified treatment of the functions and operations of stations and terminals of transportation systems; emphasis on specifications and planning criteria. Problems of locating the facility, passenger and freight handling, intramodal and intermodal interfacing, communication and control. Illustrations include railroad and subway stations, bus terminals, airports, and harbors. Prerequisite: approval of department. (Spring, even years)

223 **Traffic Engineering** (3)
Roadway traffic capacity and other road network performance measures; methods of characterizing steady and unsteady traffic flow phenomena; traffic behavior monitoring techniques, instruments, and data processing; impact of vehicle and operator dynamics on traffic flow behavior; road bottleneck flow dynamics; traffic control signalization theory and practical implementation; traffic signal control systems for conventional street networks and limited-access expressways; examples of traffic control system implementations. Prerequisite: approval of department.
(Fall, even years)

237 **Advanced Sanitary Engineering Design** (3)
Basic principles and practical considerations; hydraulic and structural requirements; basic parameters and elements of design; layout and design of water-supply and sewage systems, pumping stations, and wastewater treatment plants; development of design parameters; cost and financing; existing plant expansions. Prerequisite or concurrent registration: CE 240, 241.
(Fall, even years)

240 **Principles of Environmental Engineering I** (3)
Basic concepts in environmental engineering, including environmental chemistry and microbiology, environmental impact assessment, public health and water supply engineering, waste-water treatment, and hazardous waste management. (Fall)

241 **Principles of Environmental Engineering II** (3)
Environmental engineering processes, with emphasis on unit processes used in water and waste-water engineering, including reactor characteristics, bacterial kinetics, sedimentation, thickening, oxygen transfer, biological treatment processes, disinfection, and sludge and solids management. Prerequisite: CE 240. (Spring, even years)

242 **Solid Waste Disposal** (3)
Characteristics of solid waste; collection, transportation, and disposal practices; regional planning and management; resource and energy recovery from solid waste. Prerequisite: approval of department.
(Fall, even years)

243 **Environmental Impact Assessment** (3)
Public policy and legislation at federal, state, and local levels concerning quality of the environment. Strategies and methodologies that have been developed to assess impact of engineering projects. Technology of assessing impact on air and water quality and on land use, applied to transportation facilities, water supply and pollution-control facilities, and industrial and community development. Prerequisite: approval of department.
(Fall, odd years)

250 **Advanced Metal Structures** (3)
Conception, analysis, and design of low-rise and high-rise buildings by elastic and inelastic methods, suspended roofs, earthquake considerations, and unique structural systems. Prerequisite: CE 201 or equivalent. (Fall)

251 **Advanced Reinforced Concrete Structures** (3)
Conception, analysis, and design of low-rise and high-rise buildings by ultimate-strength methods, precast systems, progressive collapse, earthquake considerations, domes, folded plates, shell-type structures, and special topics. Prerequisite: CE 202 or equivalent. (Spring)

253 **Reliability Analysis of Engineering Structures** (3)
Probability theory, theory of structural reliability, probabilistic analysis of strength and loads, risk and reliability function, empirical distribution, probability plot. Reliability of structures in the design service life, method of perturbation, Monte Carlo simulation. Fatigue and fracture, proof testing, inspection and repair–replacement maintenance. Prerequisite: approval of department. (Fall, odd years)

254 **Special Topics in Structural Engineering** (3)
Selected problems in structural mechanics and design, such as thermal stresses in structural systems, advanced probabilistic structural mechanics, structural design for dynamic loads, structural design for repeated loads, or advanced structural applications. Topic announced in the *Schedule of Classes*. May be repeated for credit. Prerequisite: CE 210 and approval of department. (As arranged)

255 **Introduction to Ocean and Coastal Engineering** (3)
Fundamental aspects of incompressible fluid mechanics and its applications to analysis of wave motions, circulations, and other free surface flows in coastal and offshore regions; wave spectra, water-level fluctuations, tides, tsunamis, oscillations, and storm surges; wind-generated waves, including wave statistics and wave spectra; beaches, sediment transport, wave forces on coastal and offshore structures. Prerequisite: ApSc 115 or equivalent. (Fall)

256 **Coastal Processes** (3)
Coastal sediment properties and analysis, longshore transport processes and rates; sediment budget; response of beaches to wave action and structures, tidal inlets, mechanical bypassing; beach nourishment; wind transport in sand dune stabilization, sediment tracing. Prerequisite: CE 255. (Spring, even years)

257 **Harbor and Coastal Engineering** (3)
Applications of principles of ocean and coastal engineering to coastal protection structures, harbor design and navigation, breakwaters, seawalls, quays, docks; sediment transport in the coastal regime, estuaries and deltas, dredging for maintenance of channels and harbors. Prerequisite: CE 255. (Spring, odd years)

258 **Application of Probability Methods in Civil Engineering** (3)
Uncertainty in real-world information; basic probability concepts and models; random variables; useful probability distributions, statistical estimation of distribution parameters from observed data; empirical determination of distribution models; testing hypothesis; regression and correlation analyses; decision theory as applied to engineering problems in structural, geotechnical, hydraulic, transportation, and environmental engineering as well as construction planning and management. (Fall, even years)

261 **Analysis of Plates and Shells** (3)
Bending and stretching of thin elastic plates under loading with various boundary conditions, continuous plates and plates on elastic foundations; theory of folded-plate structures. Theory of curved surfaces; general linear bending theory and its simplification to membrane theory; bending stresses in shells of revolution, shallow-shell theory. Specific applications. Prerequisite: graduate status. (Spring)

262 **Design of Plate and Shell Structures** (3)
Design of long-span plate and shell roof structures in reinforced concrete and metal, design of containers for fluids and granular materials, computer applications in the analysis of such structures. Prerequisite: CE 201, 202, 261; or equivalent. (Fall, alternate years)

263 **Theory of Structural Stability** (3)
General criteria for stability, buckling of elastic and inelastic columns and frames, torsional and lateral buckling, variational methods. Buckling of plates and shells under static loads, stability of stiffened structures, effect of imperfections and boundary conditions. Prerequisite: graduate status. (Fall)

265 **Special Topics in Geotechnical Engineering** (3)
Selected topics, such as rheology of soils, computer applications, excavating and tunneling, or ocean engineering problems. May be repeated for credit. Prerequisite: approval of department. (As arranged)

266 **Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I** (3)
Nature of dynamic loads in problems arising from earthquakes, tornadoes, hurricanes, and recurring winds. Other natural-hazard loading, such as floods, expansive soils, storm surges, and tsunamis. Characteristics of earthquakes; seismicity, zoning maps, response spectra, wind characterization, and wind-tunnel simulation. Use of probabilistic concepts in load determination. Prerequisite: approval of department. (Spring)

267 **Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II** (3)
Brief review of natural-hazard loadings and random formulation, earthquake and wind design considerations and procedures, review of code requirements and specifications, balanced-risk approach for natural hazards, cost effectiveness of integrated natural-hazard design, special problems. Prerequisite: CE 266 or approval of department. (Fall)

271 **Theoretical Marine Hydromechanics** (3)
Introductory course. Derivation of the fundamental equations and boundary conditions of fluid media, application of potential-flow theory to fluid motion around two- and three-dimensional bodies, perturbation concepts. Introduction to thin-ship and slender-body theories. Derivation of force and movement of bodies in calm and disturbed water. Prerequisite: approval of department. Offered off campus only. (As arranged)

272 **Biological Wastewater Treatment** (3)
Applications of principles from CE 240 and CE 241 to biological treatment. Nitrification/denitrification, biological phosphorous removal, oxidation ditches, and sequencing batch reactors. Prerequisite or concurrent registration: CE 241. (Spring, even years)

273 **Water-Supply Engineering** (3)
Quantity and quality aspects of water-supply engineering are discussed. Topics include reservoir sizing, groundwater, distribution systems, treatment processes, and chemistry of waters. Prerequisite or concurrent registration: CE 240. (Spring, odd years)

274 **Mechanics of Water Waves** (3)
Irrotational theory for deep- and shallow-water waves, reflexion, refraction, diffraction, attenuation. Water waves of finite amplitude: shallow-water theory, tides, bores, long-waves theory, conoidal and solitary waves. Wave generation by wind, state of the art based on correlation between theory and measurements. Wave breaking and reflexion. Prerequisite: ApSc 213 or equivalent and permission of instructor. (Fall, even years)

275 **Special Topics in Ocean Engineering** (3)
Selected topics, such as marine aspects of viscous-flow theory, interfacial (internal) waves, or applied random processes in ocean and coastal engineering. May be repeated for credit. Prerequisite: approval of department. (As arranged)

276 **Water Resources Planning and Control** (3)
The parameters of water resources planning and control, economics of water resources and related natural resources, economics of water-quality control, physical parameters of water resource development, water resources law
Prerequisite: approval of department. (Fall, even years)

277 **Industrial Waste Treatment** (3)
The nature of industry and waste generation, industrial waste characteristics, waste measurements, techniques used in industrial waste treatment and control, nuclear waste control, reuse of industrial effluents and sewage for industrial process water, problems associated with treatment sewage for industrial process water and disposal of industrial wastes and their effects on receiving waters. Prerequisite or concurrent registration: CE 240.
(Fall, odd years)

278 **Pollution Transport System** (3)
Distribution of pollutants in natural waters and atmosphere, diffusive and advective transport, mathematics for stream pollutant deoxygeneration rates, groundwater pollution transport, sediment transport, thermal transport, numerical simulation of pollutant transports in streams and estuaries
Prerequisite: CE 193, ME 131. (Fall, even years)

281 **Special Topics in Water Resources** (3)
Morphometric properties of drainage basins, drainage network analysis, hydraulic geometry of streams, advanced hydraulics of alluvial channels, modeling of drainage basins, computer applications, stochastic hydrology
Prerequisite: approval of department. (As arranged)

282 **Hydraulic Modeling** (3)
Dimensional analysis and similitude. Types of models—physical, mathematical. Distortions in physical models. Erodible bed models. Prerequisite: CE 193. (Fall, alternate years)

283 **Special Topics in Environmental Engineering** (3)
Selected topics, such as public health engineering, sludge treatment and disposal, advanced chemistry for environmental engineers.
(As arranged)

284 **Numerical Methods in Water Resources** (3)
Use of microcomputers in water resources. Elements of finite difference schemes, basic operations, convergence, stability, and consistency. Nonuniform flow and error analysis; unsteady laminar flow; diffusion problems; unsteady flow in open channels; water hammer, seepage flow, and diffusion-dispersion problems. Prerequisite: approval of department. (Spring)

298 **Research** (arr.)
Basic research projects, as arranged. May be repeated for credit.
(Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

310 **Sedimentation Engineering** (3)
Problems of erosion and sedimentation. Properties of sediment. Initiation of motion. Suspension of sediment and sediment discharge theories. Sedimentation measurements. Economic and legal aspects. Prerequisite: CE 212 or approval of department. (Fall, odd years)

311 **Mechanics of Alluvial Channels** (3)
Physical processes in drainage basins and channels. Channel forms and bed forms. Hydraulics and sediment transport in alluvial channels. Design of stable channels. Qualitative and quantitative response of rivers. Channel stabilization, navigation channels. Case studies including environmental impacts. Prerequisite: CE 212 or approval of department.
(Spring, odd years)

312 **Advanced Hydraulics** (3)
Continuity, energy, and momentum equations. Turbulence, diffusion, and dispersion. Cavitation, waves, subsurface flow. Special problems in flow through hydraulic and marine structures. (Spring, even years)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

## Mechanical Engineering Graduate Courses

Courses designated "As arranged" are not offered on a regular basis. An asterisk indicates that a course is offered at NASA–Langley Research Center and may be offered on campus when arranged.

*201 **Computational Fluid Dynamics Laboratory** (1)
Development of computer programs for solving fluid dynamics problems for incompressible and compressible inviscid and viscous flows. Prerequisite or concurrent registration: ME 277. (As arranged)

*202 **Computational Aerodynamics Laboratory** (1)
Use of computational aerodynamics methods for conducting engineering studies of practical low-speed, transonic, and high-speed flows. Prerequisite or concurrent registration: ME 222. (As arranged)

*203 **Experimental Techniques in Aerodynamics** (3)
The wind tunnel, instrumentation devices, boundary corrections, testing procedures, data reduction; laboratory experiments including calibration of instruments, test-section calibrations, and two-dimensional and three-dimensional model tests. Prerequisite: approval of department. (As arranged)

204 **Advanced Instrumentation Techniques** (3)
Pressure and temperature sensors; shadowgraph, schlieren and interferometer systems; laser holography; laser doppler velocimetry; signal conditioning, use of amplifiers with shielding and grounding techniques; digital techniques; signal multiplexing; use of computers; error analysis and data handling. Lecture and laboratory. Prerequisite: approval of department. (Fall, odd years)

*208 **Research in Computational Fluid Dynamics** (1 to 3)
Specific research projects in conjunction with experimental laboratory course or computational labs. Prerequisite: approval of department. (As arranged)

216 **Structural Dynamics** (3)
Methods of solving vibration problems: differential equation, Rayleigh–Ritz finite element. Free and forced vibration of structural components: straight, curved, and thin-walled beams; plates and shells; sandwich construction. Vibration of built-up structures. Structural wave motion, wave motion in periodic structures. Prerequisite: EngS 257. (As arranged)

218 **Design of Floating and Submerged Marine Vehicles** (3)
Consideration of interaction between hydrodynamics, propulsion, and configuration aspects of design of floating structures and vehicles; effects of submergence and deep submergence; hydrofoil and vertical jet action; structural considerations. Prerequisite: EngS 228. (As arranged)

221 **Intermediate Fluid Mechanics** (3)
Continuum, kinematics of fluids; stress and strain tensors; fundamental equations of viscous compressible flows. Irrotational flows and Laplace's equations; source, sinks, doublets, and vortices. Complex-variable methods; laminar flow of viscous incompressible fluids; boundary-layer concept. Prerequisite: approval of department. (Fall)

222 **Applied Aerodynamics** (3)
Introduction to practical and computational methods for solving two-dimensional and three-dimensional aerodynamics problems. Linear methods, nonlinear potential methods, coordinate transforms, and boundary-layer methods. Prerequisite: EngS 284, ME 221. (As arranged)

224 **Fundamentals of Combustion Engines** (3)
Classification of combustion engines. Air cycles, vapor cycles, external- and internal-combustion engines; rotary engines, reciprocating engines, and turbomachinery; ideal cycle analysis; engine heat losses and friction; practical cycle analysis, status of computerized cycle analysis; combustion and knocking; carburetion and fuel injection; mixture distribution; valve mechanism; ignition systems; combustion chamber; piston-engine, rotary-engine, and turbomachinery mechanics and balance. Prerequisite: approval of department. (As arranged)

225 **Turbomachinery I** (3)
Turbine, compressor, and pump types and uses; dimensional analysis of turbomachines; cycle analysis of gas and steam turbines; energy interchange in fluid machinery; design, characteristics, and performance of turbines, compressors, and pumps; comparison of types of turbines, compressors, and pumps. Prerequisite: ME 221. (Fall)

226 **Turbomachinery II** (3)
Aerodynamics of aerofoils, flow in cascades, axial-compressor and axial-turbine aerodynamic design, compressor and turbine matching. Combustion fundamentals, combustion chemistry, and gas-turbine combustion chamber design. Prerequisite: ME 225. (Spring)

227 **Viscous Flow** (3)
Exact solutions of Navier–Stokes equations; the small Reynolds number flows, laminar boundary-layer theory, stability and separation. Reynolds stresses and turbulence; internal, boundary-layer, and mixing flows. Applications to heat and mass transfer and to reacting flows. Prerequisite: ApSc 213, ME 221 or equivalent. (Fall, even years)

231 **Hydrodynamics** (3)
Flow at large Reynolds numbers; inviscid flows in two and three dimensions and irrotational flow theory; conformal mapping and applications. Helmoltz theorems and vorticity dynamics. Applications, such as finite wing theory, instabilities, and large coherent structures. Free surface flow, Froude numbers, sheet vortex. Prerequisite: ME 221 or equivalent. (Spring)

*233 **Aeroelasticity I** (3)
Introduction to aeroelastic phenomena. Structural deformations of vehicles under static and dynamic loads. Vibrations of vehicle structures. Static aeroelastic problems (structural deformation, divergence control effectiveness, and reversal). Flutter theory and calculation of flutter boundaries. Aerodynamics of steady and nonsteady two-dimensional wings in subsonic, sonic, and supersonic flow. Strip theory applications of two-dimensional aerodynamics to three-dimensional lifting surfaces. Piston and Newtonian-flow theories. Prerequisite: EngS 257, ME 221; or equivalent.
(As arranged)

*234 **Aeroelasticity II** (3)
Brief review of potential-flow theory. Steady and oscillating three-dimensional planar and nonplanar lifting surfaces in subsonic and supersonic flow: theoretical and numerical development (acceleration potential, velocity potential), continuous-load and discrete-load methods, wings with deflected or oscillating control surfaces. General time-dependent motion of arbitrary configurations in subsonic and supersonic flow. Transonic unsteady aerodynamics of three-dimensional lifting surfaces. Dynamic response of aircraft to atmospheric turbulence. Aeroelasticity in structural design. Prerequisite: ME 233. (As arranged)

235 **Compressible Flow** (3)
Thermodynamics and physical properties of gases, fundamental equations of a compressible inviscid fluid, small-perturbation theory, expansions in Mach number and thickness parameters, second-order shock shapes, role of entropy in supersonic flow, shock-wave interactions, holograph transformation, Kármán-Tsien and other model gases, conical flows, transonic flow theory, method of characteristics, rotational nonisentropic flows. Prerequisite: ApSc 213, ME 221 or equivalent. (Spring, even years)

237 **Propulsion** (3)
Basic concepts of propulsion: energy transformations in propulsive flows, gas dynamics of combustion and detonation processes, nonuniform flows and mixing, intakes and additive drag, mechanics of flow induction, drag and thrust generation, multiple-flow thrust generators, thrust recovery and augmentation, and the propulsion spectrum. Examples taken from propellers, turbojets, turbofans, ramjets, and rockets. Prerequisite: ME 155. (Spring)

238 **Energetics of Fluid Flow** (3)
Classification of fluids and criteria for identifying flow regimes: continuum, rarefied, relativistic, and quantum flows. Dimensional analysis and similitude. Derivation of species conservation equations, including cases in which external body forces are applied, such as magnetofluid-mechanics. High-speed chemically reacting flows: aerothermochemistry. Introduction to computational fluid dynamics. Prerequisite: ApSc 213, ME 221. (As arranged)

240 **Kinematic Synthesis** (3)
Techniques for the analysis and synthesis of function, path, and motion generating mechanisms. Algebraic and graphical methods for the dimensional design of mechanisms having prescribed performance characteristics. Design for higher-order requirements. Computer-aided techniques for the optimal design of planar linkages using Burmester theory, complex number stretch-rotation operators, Chebyshev polynomials, etc. Review of recent developments and current research. Term project. Prerequisite: ME 190 or equivalent. (Spring, even years)

241 **Computer Models of Physical and Engineering Systems** (3)
Reduction of physical and engineering systems to simplified physical and mathematical models. Manipulation of models using PASCAL programming. Representation of systems using such techniques as linear graphs, networks, analogs, logical operators, and reticular geometry. Numerical algorithms for optimization, graph identification, mini-sum arithmetic, and searching. Styles of problem solving. Prerequisite: ME 117. (Spring)

242 **Advanced Mechanisms** (3)
Emphasis on spatial kinematics, with some attention to classical theorems of plane kinematics. Analysis and synthesis of mechanisms. Analytical techniques using matrices, dual numbers, quaternion algebra, finite and instantaneous screws, theory of envelopes. Applications to design of linkages, cams, gears, machined surfaces. Use of digital computers in mechanism analysis and design. Prerequisite: ME 240. (Spring, odd years)

243 **Advanced Mechanical Engineering Design** (3)
Design of mechanical engineering systems and components, requiring the integration of engineering disciplines at an advanced level. Emphasis on use of computer-aided design (CAD) methods, including computer graphics and finite element analysis, and completion of a design project. Prerequisite: approval of department. (Fall)

246 **Electromechanical Control Systems** (3)
Advanced techniques for system synthesis, compensation, and stabilization. Linear and nonlinear characterization of mechanical, electromechanical, and electronic control components. Time domain analysis and synthesis using

state space methods and matrix differential equation techniques. Introduction to digital control theory and its applications. Prerequisite: ME 182 or equivalent. (Fall)

*247 **Seminar: Aircraft Design I** (3)
Designing an aircraft to specifications. Regulatory requirements, state-of-the-art limitations, computer-aided design, integration of aircraft components, economic considerations, and iterations to final configuration to obtain specified mission profile. Prerequisite: approval of department. (As arranged)

*248 **Seminar: Aircraft Design II** (3)
Aircraft design in relation to prescribed mission requirements, different configurative concepts, detail design features. Estimation of weight, size, and power of an aircraft to satisfy mission specifications; design trade-offs and compromises. Emphasis on subsonic aircraft for steady cruising flight missions. Jet-powered and propeller-driven aircraft; supersonic cruising aircraft. Prerequisite: approval of department. (As arranged)

*249 **Spacecraft Design** (3)
Computer-aided design of spacecraft and satellites to meet specific mission requirements. Environment, propulsion, structure, heat transfer, orbital mechanics, control considerations. Use of modern computer codes for design studies. Prerequisite: approval of department. (As arranged)

*250 **Launch Vehicle Design** (3)
Computer-aided design of hypersonic launch vehicles to meet specific mission requirements. Propulsion, structures, flight path, aerothermochemistry, control considerations. Use of modern computer codes for design studies. Prerequisite: approval of department. (As arranged)

251 **Computer-Integrated Manufacturing** (3)
Automation techniques for the processing of metals, polymers, and composite materials. Survey of computer technology, computer graphics and solid modeling, data structures, computer-assisted analysis and optimization. Use of sensing and process modeling to control machining, forming, injection-molding, and welding processes. Numerical control and robot programming, applications and limitations. Program verification techniques. System-integration, scheduling, and tool-management strategies in the computer-integrated factory. Micro- and macro-social and economic considerations in the introduction of computer-integrated manufacturing. Prerequisite ME 192 or equivalent. (Fall)

252 **Projects in Computer-Integrated Design and Manufacturing** (3)
Application of the concepts of computer-integrated manufacturing to group projects, culminating in written and oral presentations. Use of a computer-aided design (CAD) system to specify the geometry of mechanical components. Generation of path instructions for numerically controlled (NC) machine tools to produce useful components. Robot programming, fixturing, and applications in materials handling, machining, and assembly. Factory simulation, part scheduling, and NC program-verification algorithms. Prerequisite: ME 251. (Spring)

253 **Tribology** (3)
Fundamentals of the friction, wear, and lubrication of metals, polymers, ceramics, and composite materials. Theories of the friction and wear of materials, techniques for the physical and chemical characterization of surfaces. Wear coatings, boundary and solid lubrication. Tribological problems in the processing of metals and in the application of ceramic components. Prerequisite: CE 166 or equivalent. (As arranged)

255 **Urban Transportation Technology** (3)
Introduction to technical evaluation of alternative transportation modes including bus, rail, and new technology. Includes system operations, energy and environmental impacts, route constraints, suspension and switching

systems, life-cycle costs, and measures of system effectiveness. Prerequisite: approval of department. (As arranged)

257–58 **Energy Systems Analysis I and II** (3–3)
Application of diverse energy analytic techniques to a variety of energy systems, devices, and processes. Solar photovoltaics, fuel cells; tidal, geothermal, wind energy conversion; controlled thermonuclear fusion and magnetohydrodynamics. Synthesis of fuels and structural aspects of electric utilities and their relation to decentralized energy. Coupled issues, such as food–energy, population–energy, and transportation–information. Analytical methods applied to these technologies: hands-on machine literature searching; supply and demand forecasting, including Delphi, scenario writing, linear and multiple statistical regression analysis; data interpretation of extremal statistics applied to the design of wind electric generators; input–output analysis; net-energy analysis; life-cycle costing; second-law (exergy) analysis; technological assessment; mathematical modeling of energy systems and computer-assisted synthesis (CAS). It is recommended that ME 257–58 be taken in sequence. Prerequisite: approval of department. (Academic year)

259 **Solar Heating Systems** (3)
Fundamentals of solar radiation; methods of solar energy collection and storage. Theory of flat-plate collectors, solar energy system analysis, design of solar water-heating and space-heating systems, economics of solar heating systems. Passive solar heating systems. Solar industrial process heat. Prerequisite: ME 187 or equivalent. (Fall)

260 **Heating and Air-Conditioning of Buildings** (3)
Basic concepts and engineering data including psychometrics and comfort conditions. Heating and cooling load calculations, computer programs for system design and for energy consumption analysis. Codes and standards for building energy management, energy conservation opportunities. Heating and air-conditioning systems; all-air, air-and-water, all-water, and central-control systems. Cost estimates and economic analyses, life-cycle costing. Prerequisite: ME 187 or equivalent. (Spring)

261 **Air Pollution I** (3)
Introductory course on the generation, monitoring, and control of air pollution. Atmospheric pollutants; current levels and health problems. Combustion chemistry and mixing. Application to automobile and power plant controls. Photochemical processes; smog and measurements. Atmospheric dispersion; inversion and acid rain. Prerequisite: approval of department. (Fall, odd years)

262 **Air Pollution II** (3)
Trends in the design of nonpolluting automotive sources. Atmospherics of pollution diffusion and long-term chemical evolution. Weather interaction. Diagnostic techniques and remote sensing. Air pollution standards. Noise control. Prerequisite: ME 261 or equivalent. (Spring, even years)

267 **Power Plant Pollution Control** (3)
The control of existing emissions from stationary sources. Aerosol controls; sedimentation, precipitation, filtration, and wet collection. Application of scrubbers, catalysts, and combustion modification to control of gaseous emissions from stationary sources. Special techniques for fine particulate control (fabric, electrostatics). Waste disposal. Alternative power systems and future design concepts. Thermal pollution. Prerequisite: ME 261 or equivalent. (Fall, even years)

*269 **Wind Tunnel Research Techniques** (3)
A comprehensive survey of wind tunnel research facilities and techniques. Subsonic, transonic, supersonic, and hypersonic facilities. Basic principles of wind tunnel design; associated research equipment, including models, balances, instrumentation, and flow-visualization techniques. Data acquisition

and reduction, research methods, static and dynamic testing techniques, powered-model testing, typical research data, significant research contributions. Prerequisite: approval of department. (Spring)

270 **Aerodynamics of Flight Vehicles** (3)
Aerodynamic loads on flight vehicles, interference effects, application of aerodynamic theory to aircraft design, studies of aircraft dynamics and performance. Prerequisite: approval of department. (Spring)

*271 **VTOL Aircraft Technology** (3)
Fundamental principles of VTOL aircraft. Hovering performance based on momentum theory, analysis of jet-induced interference effects, transition aerodynamics, theoretical stability and control and correlation with flight data, ground-effect theory and experiment, handling-qualities criteria, elements of instrument approach and landing problem. Prerequisite: approval of department. (Spring)

*272 **Powered-Lift Technology** (3)
Basic principles of powered-lift aircraft. High-lift aerodynamics, low-speed stability and control, fundamentals of internally blown and externally blown powered-lift concepts, the spanwise blowing scheme to delay wing stall. Use of powered-lift for improved maneuverability of fighter aircraft, aerodynamic ground effects, alleviation of noise of powered-lift systems, aerodynamic loads associated with blown flaps. Prerequisite: approval of department. (Fall)

*273 **Principles of Automatic Flight Control** (3)
Design of aeronautical instrumentation and feedback controls; mathematical models of sensors, controllers, and actuators; theory of feedback control, stability, accuracy, and speed of response; equalization effects of nonlinearities and noise. Prerequisite: approval of department. (Spring)

*274 **Principles of Flight Guidance** (3)
Guidance requirements for atmospheric flight. Implementation of guidance systems using inertial and radio techniques in conjunction with automatic data processing. Prerequisite: ME 273. (Fall)

275 **Stability and Control of Vehicles** (3)
Derivation of equations of motion, Euler transformations and direction cosines, stability derivatives and linearization of equations of motion, stability of linear systems with application to longitudinal and lateral dynamics, Laplace transform techniques, and frequency-response analysis. Prerequisite: approval of department. (Fall)

276 **Mechanics of Space Flight** (3)
First- and second-order Hamilton–Jacobi perturbation theory applied to artificial satellites, von Zeipel's methods, special and general perturbation theories for third-body perturbations. Differential correction of orbits by weighted least-squares and minimum variance techniques. Comparison of various filtering techniques as applied to orbit determination and other space-flight parameter estimation. Prerequisite: approval of department. (As arranged)

277 **Computational Fluid Dynamics** (3)
Theory of discrete methods for solving the governing equations of fluid dynamics. Potential flow, Euler equations, Navier–Stokes equations. Emphasis on algorithm development appropriate to modern supercomputers. Prerequisite: ME 221, EngS 284. (As arranged)

*279 **Special Topics in Flight Sciences** (3)

280 **Intermediate Thermodynamics** (3)
Macroscopic and microscopic descriptions of thermodynamic systems. Fundamental equation; conditions of equilibrium and stability of thermodynamic systems. Review of methods of statistical thermodynamics, microstate, macrostate, and thermodynamic probability. Classical and quantum statistics. Properties of perfect gases and crystals. Review of elements of kinetic

theory and transport phenomena. Chemical equilibrium and selected applications. Prerequisite: approval of department. (Fall)

281 **Advanced Thermodynamics** (3)
The concept of ensembles; Boltzmann, Fermi–Dirac, and Bose–Einstein statistics; balance and entropy-production equations. Presentation of linear, nonequilibrium thermodynamics, using Onsager's reciprocity relations. Prigogine's nonlinear, nonequilibrium thermodynamics. Consideration of Benard instability and fluctuation theory, using the formulation of Haken; bifurcation and catastrophe theories. Integration of subjects using information theory; computational techniques to determine thermophysical properties. Prerequisite: ME 280 or equivalent. (Spring)

283 **Nuclear Reactor Engineering I** (3)
World energy resources and the importance of fission energy. Atomic and nuclear structure, nuclear fission and chain reaction, critical mass. Nuclear reactor classification, history of reactor development. Nuclear reactions and radiation; radioactive decay; radiation detection, hazards, and protection. Neutron reactions, neutron diffusion and slowing down, the criticality condition. Reflected reactors, homogeneous and heterogeneous reactor systems, transient reactor behavior and control, description of pressurized and boiling water reactors, other reactor systems. Environmental considerations, reactor safety. Prerequisite: approval of department. (As arranged)

284 **Nuclear Reactor Engineering II** (3)
Energy removal; reactor coolants; reactor thermal hydraulics, radiation damage and reactor material problems. Reactor fuels, shielding, mechanical and structural components. Preliminary reactor design, fuel cycles, nuclear reactor systems, engineered safety systems. The economics of nuclear power. Prerequisite: ME 283. (As arranged)

*285 **Reaction Kinetics** (3)
Theoretical aspects of kinetics of homogeneous and heterogeneous reactions in gaseous and liquid systems. Prerequisite: ME 280. (As arranged)

286 **Special Topics in Mechanical Engineering** (3)
Prerequisite: approval of department. (As arranged)

287 **Heat Conduction** (3)
Conduction of heat through solid, liquid, and gaseous media. Formulation and methods of analytical, numerical, and analog solutions. Steady two- and three-dimensional problems, problems in unsteady heat conduction. Conduction in composite regions. Prerequisite: ApSc 213 or equivalent. (Fall, odd years)

288 **Convective Heat and Mass Transfer** (3)
Heat and momentum transfer in laminar and turbulent flow. Application of boundary-layer theory to problems of forced convection. The laminar boundary-layer and similarity solutions. Heat convection in turbulent flow, momentum-heat transfer analogy. The influence of temperature-dependent fluid properties. Convective heat transfer at high velocities, mass transfer, formulation of a simplified theory. Some solutions to the conserved-property equation. Prerequisite: ME 221 or equivalent. (Spring, odd years)

289 **Radiative Heat Transfer** (3)
Nature of thermal radiation; laws of intensity attenuation and generation. Solid angles and frequency spectrum: flames, solar ponds, beam energy transmission. Surface properties and view factors: design of furnaces and radiant boilers. Radiation vs. convection processes: reentry, lasers. Applications to optical temperature diagnostics; emission, absorption, and scattering techniques; remote sensing. Prerequisite: approval of department. (Fall, even years)

*290 **Kinetic Theory of Gases** (3)
Equation of state and physical properties for gas composed of discrete particles, relation of kinetic theory to thermodynamics, Maxwell distribution

of molecular velocities, Boltzmann H theorem. Molecular interactions, free paths, collision rates, scattering coefficients. Introduction to diffusion, viscosity, heat conduction; imperfect gases; flow of gases at low density. Prerequisite: ME 280. (As arranged)

291–92 **Power Systems** (3–3)
Design of thermal power system components and system optimization. Steam-cycle power generation system components: steam generators, reactor coolant system, condensate and feedwater system, turbine-generator, waste heat removal. Heat balance studies, options for improved cycle efficiencies, system optimization studies, component selection and design, cooling towers, lakes and ponds. Review of safety and pollution regulations; testing, inspection, and codes. Survey of electric power system technology. Prerequisite: ME 148, 187; or equivalent. (Academic year)

293 **Combustion** (3)
Basic combustion phenomena. Rate processes and chemical kinetics. Chain reaction theory. Detonation, deflagration, diffusion flames, heterogeneous combustion. Combustion technology, computer modeling, and experimental measurements. Impact of pollution regulations and alternate fuels. Prerequisite: approval of department. (Spring, even years)

295 **Statistical Thermodynamics** (3)
Distribution functions; Boltzmann, Bose–Einstein, and Fermi–Dirac statistics; partition functions, correspondence between classical and statistical thermodynamics. Systems with negligible effects of interparticle forces, perfect gases, perfect electron gas, photon gas. The Debye solid, the Einstein solid. Prerequisite: ME 280. (As arranged)

296 **Special Topics in Heat and Mass Transfer** (3)
Prerequisite: approval of department. (As arranged)

297 **Special Topics in Fluid Mechanics** (3)
Prerequisite: approval of department. (As arranged)

298 **Research** (arr.)
Research as arranged. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

310 **Mechanics of Non-Newtonian Fluids** (3)
Classification of fluids, physical properties of composite fluids, convected coordinate systems, fundamentals of constitutive equations of composite fluids. Purely viscous fluids, Reiner and Rivlin theories, power-law fluids. Linear theory of viscoelastic fluids, Boltzmann principle, quasi-linear viscoelasticity. Nonlinear theory of viscoelasticity, Rivlin–Ericksen theory. Viscoplastic fluids, Bingham plastic fluids, Oldroyd's analysis. Viscometry and rheogoniometry, turbulent flow of suspensions and emulsions in pipes, fractional drag reduction by polymeric additives. Prerequisite: approval of department. (As arranged)

311 **Nonsteady Flow** (3)
Eulerian and Lagrangian kinematics. Fundamental equations of nonsteady viscous flow. Characteristics and waves, initial and boundary conditions. Piston theory and the oscillating airfoil. Nonsteady flows with entropy production. Discontinuities, interactions, and special transients. Gas dynamics of nonsteady combustion. Analogies and applications. Prerequisite: ME 235 or 237, or equivalent. (As arranged)

312 **Theory of Turbulence** (3)
Concept of turbulence, transition and linear theory of flow stability, experimental observations on turbulence generation, turbulent kinetic energy distribution, statistical description of turbulence, energy cascade and energy spectrum in turbulence, mean turbulent energy and Reynolds stress closure models, turbulent shear flows in free turbulence and wall turbulence, turbulence in atmospherical environment and effects on air pollution and weather systems, turbulent drag reduction. Prerequisite: ME 227. (As arranged)

313 **Magnetofluidmechanics** (3)
Thermodynamics and fluid mechanics of electrically conducting liquids and gases, theory and applications. Thermodynamics and transport properties of plasmas formulated, reaction kinetics and plasma reactions. Fundamental equations (mass, momentum, and energy) of magnetofluidmechanics. Flow with infinite and finite conductivity, Alfven waves and wave phenomena, flow with heat transfer and friction. Relativistic magnetofluidmechanics, dimensional analysis and scaling parameters. Applications to MHD power generators, pumps, plasma jets and propulsion, controlled thermonuclear fusion, chemical synthesis and mineral separation. Prerequisite: ME 221, 280. (As arranged)

315 **Hypersonic Flow** (3)
Shock waves in hypersonic limits, one-dimensional piston problem, and method of characteristics. Hypersonic small-disturbance theory and exact solutions. Unsteady analogy and similarity parameters. Newtonian flow theory for slender and blunt bodies. Tangent wedge/cone approximation and shock-expansion theory. Delta wing problems. Hypersonic viscous interaction phenomena and real-gas effects. Features of hypersonic boundary layers and local similarity approximations. Prerequisite: ME 235; ApSc 211, 213. (As arranged)

317 **Physical Gas Dynamics** (3)
Molecular and atomic phenomena in gases, intermolecular forces, specific heats, equation of state for a real gas, dynamics of dissociating gas, radiation. Prerequisite: ME 235, 295 or equivalent. (As arranged)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

## Engineering Science Graduate Courses

Courses designated "As arranged" are not offered on a regular basis. An asterisk indicates that a course is offered at NASA–Langley Research Center and may be offered on campus when arranged.

206 **Technology and Human Needs** (3)
Sociology of science and engineering. Social consequences of modern technology, including energy systems, environmental issues, transportation, communications biomechanics, and the use of computers in conjunction with it. Institutional barriers and incentives to socioeconomic progress made possible by high technology. Prerequisite: approval of department. (As arranged)

207 **Engineering Climatology** (3)
Constitution of physical properties of Earth and atmosphere, stability conditions, energy balance characteristics, atmospheric motions, storm forecasting models, tree-ring analysis, evaporation, precipitation, fog formation, soil moisture, ground frost. Prerequisite: approval of department. (As arranged)

208 **Energy Conservation** (3)
Methods of conserving energy without sacrificing productivity and the quality of life. Conservation methods in the home, in transportation, and in industrial, manufacturing, and commercial sectors. Second law of thermodynamics from a conservation viewpoint. Construction methods for low energy consumption in large and small edifices. Environmental effects and low fuel consumption in ground and air transportation. Greenhouses and natural fertilizers. Prerequisite: approval of department. (As arranged)

210 **Quantitative Aspects of Social Phenomena** (3)
Mathematical models presenting social phenomena. Historical review of attempts to quantify social phenomena. Comparison of deterministic and stochastic analysis. Population growth, birth and death rates, population diffusion, Lancaster equation, Richardson's approach, the Forrester–Meadows model. Kinetic theory formulation of peaceful coexistence. Probability distributions, characteristic functions, and central-limit theorem. Brownian motion approach to speculation and the stock market. Traffic flow, the statistical approach and Lighthill's method. Quality-of-life indicators and quantification of social indicators. Environmental modeling. Thermodynamic approach to self-rejuvenating systems and its application in government and organizations. Prerequisite: approval of department.
(As arranged)

212 **Nonrenewable Resources** (3)
Nonrenewable fossil and fissil fuel resources. The interplay of geology, engineering applications, and economics. Fossil fuels include coal, petroleum, natural gas, shale; fissil fuels include uranium and thorium. Exploration, excavation, production, and processing. Conversion techniques from solid to liquid and gaseous fuels. Environmental impacts and supply-demand issues. Prerequisite: ME 257 or approval of department.
(As arranged)

213 **Renewable Resources** (3)
Renewable energy resources, or those believed to be of practically indefinite duration. Solar energy aspects, excluding solar heating of buildings. Biomass, including food, fiber, and photosynthesis. Biological and chemical processes, pyrolysis, enzymatic hydrolysis, and hydrogenation. Solar photovoltaics, wind energy conversion systems, ocean thermal energy conversion, tidal energy, geothermal energy. Central vs. distributed energy systems. Prerequisite: ME 257 and 258 are desirable, or approval of department.
(As arranged)

214 **Geothermal Energy** (3)
Geothermal energy due to thermal gradients in the earth, fundamentals of geological gradients, geographic location of potential geothermal energy sources, comparison of methods of exploration and study of steam and hot rock systems. Generation of electricity from geothermal sources. Obtaining hot water process heat. Equipment design. Environmental effects and means of mitigating adverse conditions. Prerequisite: approval of department.
(As arranged)

215 **Advanced Strength of Materials** (3)
Deflection of beams using singular functions, unsymmetrical bending of beams, beams on elastic foundation. Beam-column problems, shear center for thin-walled beam cross sections, curve beams. Applications of energy methods, torsion, basic equations for theory of elasticity, thin- and thick-walled cylinders, stress concentration, failure criteria and elastic–plastic analysis of beams under bending and torsion. Prerequisite: CE 120. (Spring)

217 **Analytical Mechanics** (3)
Fundamental principles, generalized coordinates, variational principles and Lagrange's equations, nonholonomic systems, Hamilton's equations, theory of small oscillations. Prerequisite: approval of department.
(As arranged)

218 **Introduction to Continuum Mechanics** (3)
Kinematics of a continuum, equations of motion, linear isotropic elastic solid, Newtonian viscous fluid, integral formulation of general principles, simple applications. Prerequisite: approval of department. (Fall)

221 **Theory of Elasticity I** (3)
Review of basic concepts and equations, formulation of boundary–value problems, variational principles, general torsion and bending of prismatical

rods, solution of plane problems using complex analysis. Prerequisite: ApSc 211, EngS 215 or 218. (Spring)

222 **Theory of Elasticity II** (3)
Three-dimensional elastostatics, thermoelasticity, and introduction to elastic wave propagation. Prerequisite: EngS 221. Prerequisite or concurrent registration: ApSc 215. (Fall, odd years)

228 **Physical Oceanography** (3)
Seawater, equations of motion, interaction between air and sea, currents, wind waves in deep and shallow waters, long ocean waves, tides, wave statistics, sea ice. Prerequisite: ME 221 or equivalent. (As arranged)

229 **Transformations in Materials** (3)
Thermodynamics of solids, statistical interpretation of entropy, lattice defects, equilibrium in multicomponent systems, rate theory, diffusion, phase transformations, nucleation and growth, precipitation, martensitic transformations. Prerequisite: CE 140, ME 280. (Spring, odd years)

230 **Deformation of Materials** (3)
Dislocation geometry, stress field of dislocations, forces on a dislocation, dislocation reactions, dislocation dynamics, yield, plastic flow, work hardening, recovery, solid solution hardening, precipitation and dispersion hardening. Prerequisite: CE 166, EngS 218. (Fall, odd years)

231 **Structure of Materials** (3)
Crystal structures, theory of metals, crystal energy, covalent bonding, metallic bonding, quantum theory of metals. Insulators, semiconductors, magnetism, superconductivity, dislocation point defects. Solid solutions, precipitates, second phases, structure of real materials. Prerequisite: CE 140. (Fall)

233 **Mechanics of Composite Materials** (3)
Stress–strain relationship for orthotropic materials, invariant properties of an orthotropic lamina, biaxial strength theory for an orthotropic lamina. Mechanics of materials approach to stiffness, elasticity approach to stiffness. Classical lamination theory, strength of laminates. Statistical theory of fatigue damage for composites. Prerequisite: approval of department. (Spring, odd years)

234 **Composite Materials** (3)
Principles of composites and composite reinforcement. Micromechanics and failure, interface reactions in various composites, reinforcing materials. Structure of composites: fiber-reinforced polymers, filler-reinforced polymers, fiber-reinforced metals, directionally solidified alloys, dispersion-strengthened metals. Prerequisite: approval of department.
(Spring, even years)

236 **Experimental Techniques in Materials Science** (3)
Sample preparation. Optical microscopy including polarized light methods, phase contrast, interferometry. X-ray diffraction including Laue technique and Debye–Scherrer method. Electron probe microanalysis. Electron microscopy, including electron optics, image formation, and contrast for scanning and transmission electron microscopy. Field ion microscopy. Prerequisite: EngS 231. (Spring, odd years)

237 **Environmental Effects on Materials** (3)
Aqueous corrosion, electrochemistry, electrochemical reactions, polarization. Environmental factors, intergranular corrosion, stress corrosion, high-temperature corrosion. Kinetics and mechanisms of corrosion, oxidation, liquid metal corrosion, irradiation effects. Prerequisite: approval of department. (Fall, even years)

*239 **Physical Ceramics** (3)
Crystal chemistry and the systematic study of the structure of ceramic materials. Solid reactions occurring at elevated temperatures. Sintering vitrification, diffusional mechanisms and effects. Reaction rate theory. Elas-

tic, anelastic, and plastic properties of ionic and covalent solids. Viscoelastic behavior of vitreous and vitreous-solid systems. Phase equilibria of ceramic systems. Prerequisite: approval of department. (As arranged)

240 **Fracture Mechanics** (3)
Fundamentals of brittle fracture, Griffith theory and extensions, mechanics of fracture. Linear elastic systems, plasticity considerations, fracture toughness. Engineering analysis, notch-strength analysis with limit approach, crack-propagation laws, fatigue, fracture testing. Comparison of recent continuum theories. Prerequisite: EngS 221 or CE 261.
(Spring, even years)

241 **Failure of Materials** (3)
Tensile and shear deformation, yield, dislocation motion, geometry of slip, single and polycrystal deformation, twinning, creep deformation, polymer deformation, fracture, Griffith theory, fracture toughness, transition temperature, microstructure effects, environmental effects, stress corrosion cracking, cyclic stress and strain, fatigue crack initiation and propagation, statistical analysis, low-cycle fatigue, failure analysis. Prerequisite: CE 166
(Fall, odd years)

242 **Materials Recycling and Recovery** (3)
Techniques and technologies for recovering and reusing waste materials and developing low-resource waste systems. Direct relationships of recycling and waste reduction to energy conservation. Effect of recycling on energy and environmental impacts of alternative materials and products; legal, economic, institutional, and environmental policy aspects of recycling and waste reduction. Prerequisite: approval of department. (As arranged)

249 **Special Topics in Materials Science** (3)
Prerequisite: approval of department. (As arranged)

256 **Plasticity** (3)
Introduction to the continuum theory of plastic deformation. Physical basis of rate-independent plasticity. Concepts of yield, strain hardening and softening, reverse yield, and cyclic plasticity. Constitutive equations describing plastic deformation, formulation and exact solution of one-dimensional problems, full-field formulation of multidimensional problems. Stability of plastically deformed media. Elastic–plastic wave propagation. Prerequisite EngS 215 or 218. (Spring, odd years)

257 **Theory of Vibrations**
Damped and undamped natural vibration, response of single- and multiple-degrees-of-freedom systems to steady-state and transient excitations, modal analysis, nonproportional damping and complex modes, variation formulation of equations of motion, discretization of structural systems for vibrational analysis. Prerequisite: approval of department. (Fall)

259 **Random Vibration of Structures** (3)
Introduction to random processes, responses of linear structures to stationary and nonstationary random inputs. Structural responses to earthquakes, waves, boundary-layer turbulences, wind loads, etc. Failure analysis of structures under random loads. First passage failure, fatigue, stress corrosion, and crack propagation under random stress histories. Prerequisite ApSc 115 or CE 258. Prerequisite or concurrent registration: EngS 257.
(Spring, even years)

260 **Random Process Theory in Engineering** (3)
Spectral analysis, linear system, the superposition principle. Statistical prediction and probability function, Rayleigh distribution and its properties, threshold crossing problems, prediction of extreme values. Statistical prediction of random vibration, application to civil and mechanical engineering
Prerequisite: ApSc 115 or equivalent. (Fall)

270 **Theoretical Acoustics I** (3)
Basic acoustic theory in stationary and uniformly moving media; waves in infinite space; sound transmission through interfaces between layered media

and between media in relative motion; sound radiation from simple solid boundaries, source and dipole fields; propagation inducts and enclosures; elements of classical absorption of sound. Prerequisite: ME 221, ApSc 213; or equivalent. (As arranged)

271 **Random Process Theory I** (3)
Random processes; stationarity and ergodicity; mean-square calculus; auto- and cross-correlations and spectra; random processes in linear systems; mean-square estimation, prediction, and filtering; zero and level crossings and peak distributions; applications in aerospace sciences. Prerequisite: EngS 203 or approval of department. (As arranged)

272 **Random Process Theory II** (3)
Discrete and continuous state Markov processes; chains, queues, diffusion, and passage problems; linear and nonlinear estimation and stochastic control; estimation of correlations and power spectra; applications in engineering problems; scattering from random surfaces; stochastic linearization and stability. Prerequisite: EngS 259 or 260 or 271. (As arranged)

*273 **Time Series Analysis** (3)
Harmonic analysis of deterministic and random signals; auto- and cross-correlations and spectra; coherence; modern techniques for spectral estimation, including periodogram, Blackman–Tukey, direct filtering, maximum entropy, and maximum likelihood; fast Fourier transform and zoom FFT; effects of finite length and digitization on bias and variability; spectral analysis with randomly sampled data; digital filtering; applications in modern technology. Prerequisite: EngS 271 or approval of department. (As arranged)

274 **Environmental Noise Control** (3)
Introduction to the physical effects of noise and vibration on humans, practical sources of noise and their control. Building, ventilation-system, mechanical-equipment, aircraft, automobile, and truck noise. Factors affecting vibration levels and vibration control by structural design, damping, and isolation. Prerequisite: EngS 270, ME 215. (As arranged)

*275 **Theoretical Acoustics II** (3)
General theory of sound propagation in homogeneous media, viscous and heat conduction effects; methods of solving the inhomogeneous wave equation; theory of sound radiation, sources, dipoles, quadrupoles; radiation from moving sources; scattering and diffraction of sound by obstacles; introduction to acoustics of inhomogeneous media, geometric acoustics. Prerequisite: EngS 270. (As arranged)

*276 **Acoustical and Mechanical Measurements** (3)
Characteristics of signals, basic transducer elements, standards of measurements and calibrations, signal recording and processing, acoustical and vibration instrumentation, vibration exciters, vibration testing techniques, flow mechanical measurements. Prerequisite: EngS 270, ME 215. (As arranged)

*277 **Physical Acoustics** (3)
Concepts of continuum mechanics and thermodynamics, wave propagation in real media, thermal viscous and relaxational attenuations, piezoelectric crystals and ultrasonics, wave propagation in rigid and deformable porous media. Prerequisite: EngS 275. (As arranged)

*278 **Psychological and Physiological Acoustics** (3)
Auditory system and its response to sound, experimental methodology in psychoacoustics, subjective response to sound, environmental noise and its evaluation, criteria for the prediction of noise nuisance, nonauditory system response to noise. Prerequisite: approval of department. (As arranged)

*279 **Human Factors in Engineering** (3)
Human–machine interface, effects of physical stress on human behavior and performance, life-support system, learning and conditioning of physical stress. (As arranged)

*280 **Special Topics in Acoustics** (3)
Current methods and problems in acoustics. Topics chosen from such areas as aerospace noise generation and control; instruments and procedures for acoustics measurements; and responses of structures, people, and communities to noise. Prerequisite: approval of department. (As arranged)

*281 **Advanced Programming Techniques for Engineering Problems** (3)
Techniques for efficient construction of computer programs for engineering systems with emphasis on fundamental structured programming principles. Effects of CPU organization and other hardware features of computer systems on numerical computations involved in engineering systems. Organization and management of data bases for large engineering systems. Use of computer graphics. Prerequisite: approval of department. (As arranged)

282 **Computer-Aided Design** (3)
Fundamental concepts in the development of computational algorithms for the design of structures, machine components and assemblies, and other engineering systems. Representation of the design process and design specifications as a network of decision tables and logical flags. Optimization techniques and algorithms in design applications. Interactive computer-aided design methods based on the use of remote-access computer terminals. General-purpose computer programs for engineering analysis and design. Students, individually or in groups, develop a small-scale, general-purpose design program in an appropriate area, such as structural design, machine design, urban planning, or environmental quality control. Prerequisite: EE 51 and CE 210, or equivalent, and approval of department. (Fall)

283 **Application of Computer Graphics in Engineering** (3)
Curve-fitting techniques as applied to computer graphics; construction of a library of geometric lines and curves connecting a series of discrete points. Representation of two- and three-dimensional geometrical shapes by a set of discrete points. Automatic generation and display on CRT screen of geometrical shapes consisting of a grid of discrete points interconnected by user-selected geometric shapes. Automatic mesh generation, transformations, projections, and the concept of "hidden" lines. Use of remote computer terminals and graphic-plotter equipment in interactive computer-graphics applications. Prerequisite: EE 51 or equivalent; or concurrent registration in EngS 284. (Spring)

284 **Numerical Methods in Engineering** (3)
Uses of computers in engineering and science. Numerical interpolation, integration, and differentiation. Least-squares approximations and application to data fitting, roots of polynomials, eigenvalue and eigenvector problems. Solution of systems of linear equations, ordinary differential equations, introduction to solution of partial differential equations. Applications to initial and two-point boundary–value problems in engineering mechanics and other areas of engineering. Prerequisite: approval of department. (Fall)

285 **Finite Element Methods in Engineering Mechanics** (3)
Calculus of variations. Variational formulation of the finite element method. Techniques of constructing and assembling characteristic element matrices. Rayleigh–Ritz method. Galerkin method. Application to problems in structural mechanics, fluid mechanics, heat flow, and solid mechanics. Computer implementation of the finite element method. Convergence characteristics. Prerequisite: approval of department. (Spring)

*286 **Analysis and Design of Thin-Walled Structures** (3)
Statics of thin-walled beams and panels, force interplay between stiffeners and skin in the analysis and design of stiffened thin-walled structures. Strength and stiffness of locally buckled stiffened structures. Classification of loads and safety factors. Considerations governing the design of thin-walled structures and critical evaluation of various design procedures. Prerequisite: approval of department. (As arranged)

*287 **Automated Design of Complex Structures** (3)
Review of techniques for automated design, including mathematical programming, fully stressed design, and optimality criteria. Application of automated design techniques to stiffened and composite shell-type structures. Multiple-load conditions and design constraints. Prerequisite: approval of department. (As arranged)

288 **Advanced Finite Element Methods in Structural Mechanics** (3)
Review of variational formulation of the finite element method. Formulation of various continuum and structural elements. Application to static and dynamic problems in elasticity, plasticity, large deflection, and instability in plates and shells. Recent developments in finite element methods. Prerequisite: CE 210, EngS 285. (As arranged)

289 **Special Topics in Theoretical and Applied Mechanics** (3)
Prerequisite: approval of department. (As arranged)

298 **Research** (arr.)
Basic research projects as arranged. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

*310 **Aeroacoustics** (3)
General theory of aerodynamic sound generation and propagation, Lighthill's formulation of jet noise, similarity laws, supersonic and subsonic jet noise, boundary-layer noise, fan and compressor noise, helicopter noise, sonic booms. Current problems in aeroacoustics. Prerequisite: EngS 275. (As arranged)

*311 **Nonlinear Acoustics** (3)
Finite amplitude waves and waves in moving stratified media. Interaction between linear and nonlinear waves, wave propagation through nonlinear media, applications to transmission of sound through ducts with flow and absorbing walls. Prerequisite: approval of department. (As arranged)

*312 **Theory of Random Vibration** (3)
Response of linear systems to stationary random inputs. Failures resulting from dynamic response. Response of space vehicle structures to intense noise fields, measurement, and application. Prerequisite: EngS 271, ME 215. (As arranged)

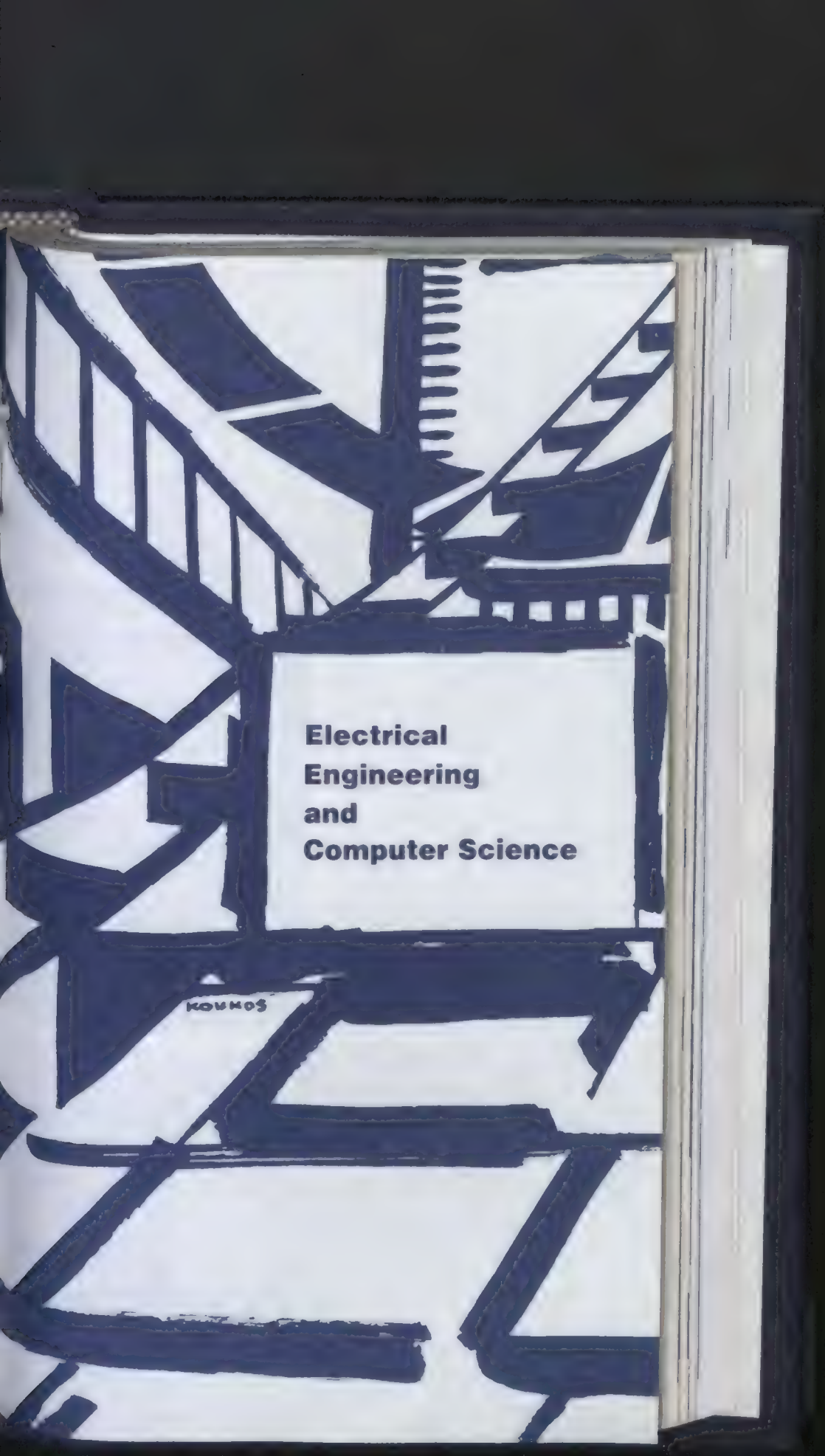
*313 **Structural Acoustic Interaction** (3)
Coupled response of structures to sound, system of infinite extent, system of finite extent, sound radiation from structure, sound transmission through structure. Panel response to turbulent boundary-layer excitation. Sound radiation from mechanically excited structure vibration. Prerequisite: EngS 270, 312. (As arranged)

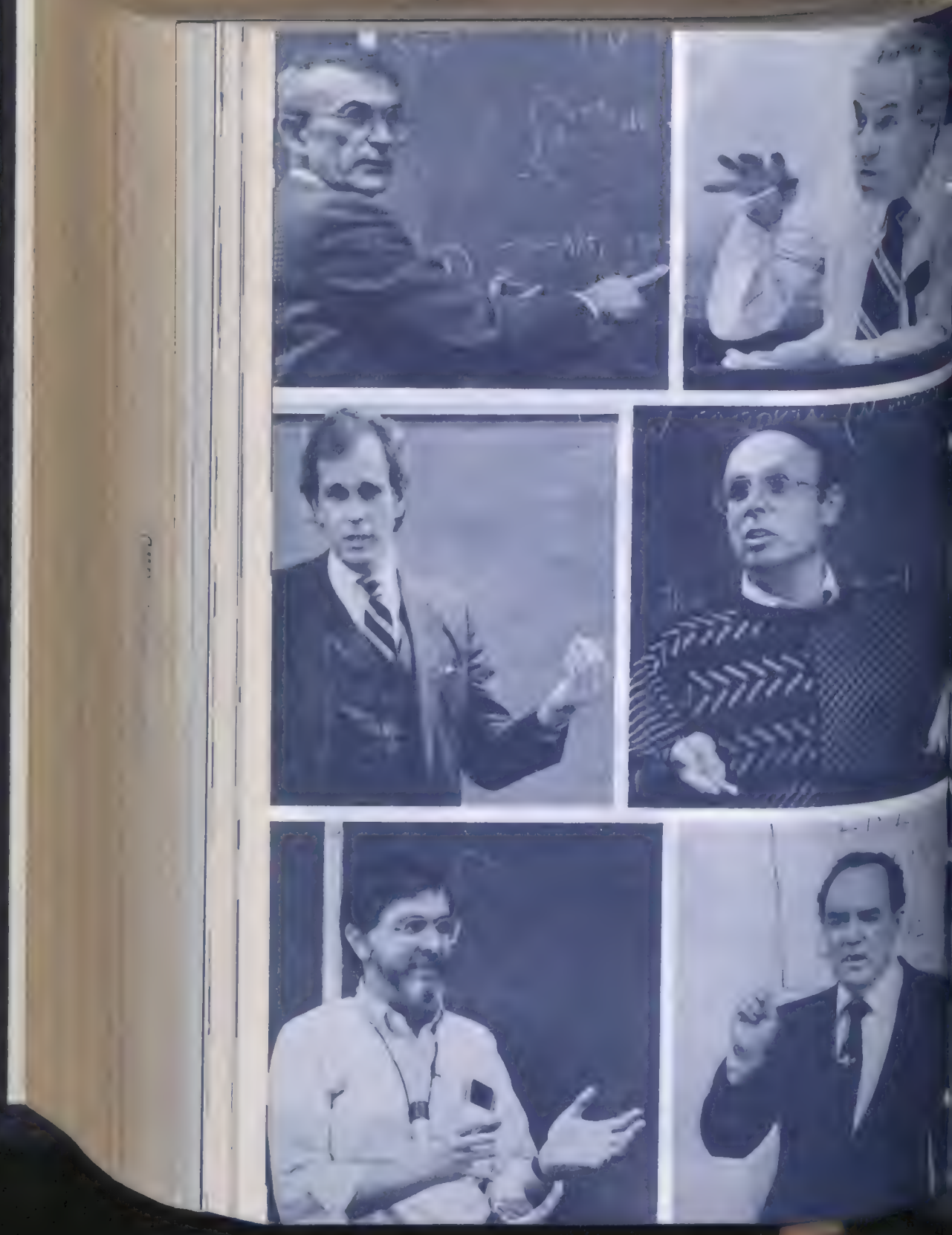
314 **Advanced Numerical Methods** (3)
Finite difference, finite element, and spectral methods for elliptic, parabolic, and hyperbolic differential-equation systems. Parallel- and array-processing techniques. Nonlinear equations. Prerequisite: EngS 284, ApSc 213. (As arranged)

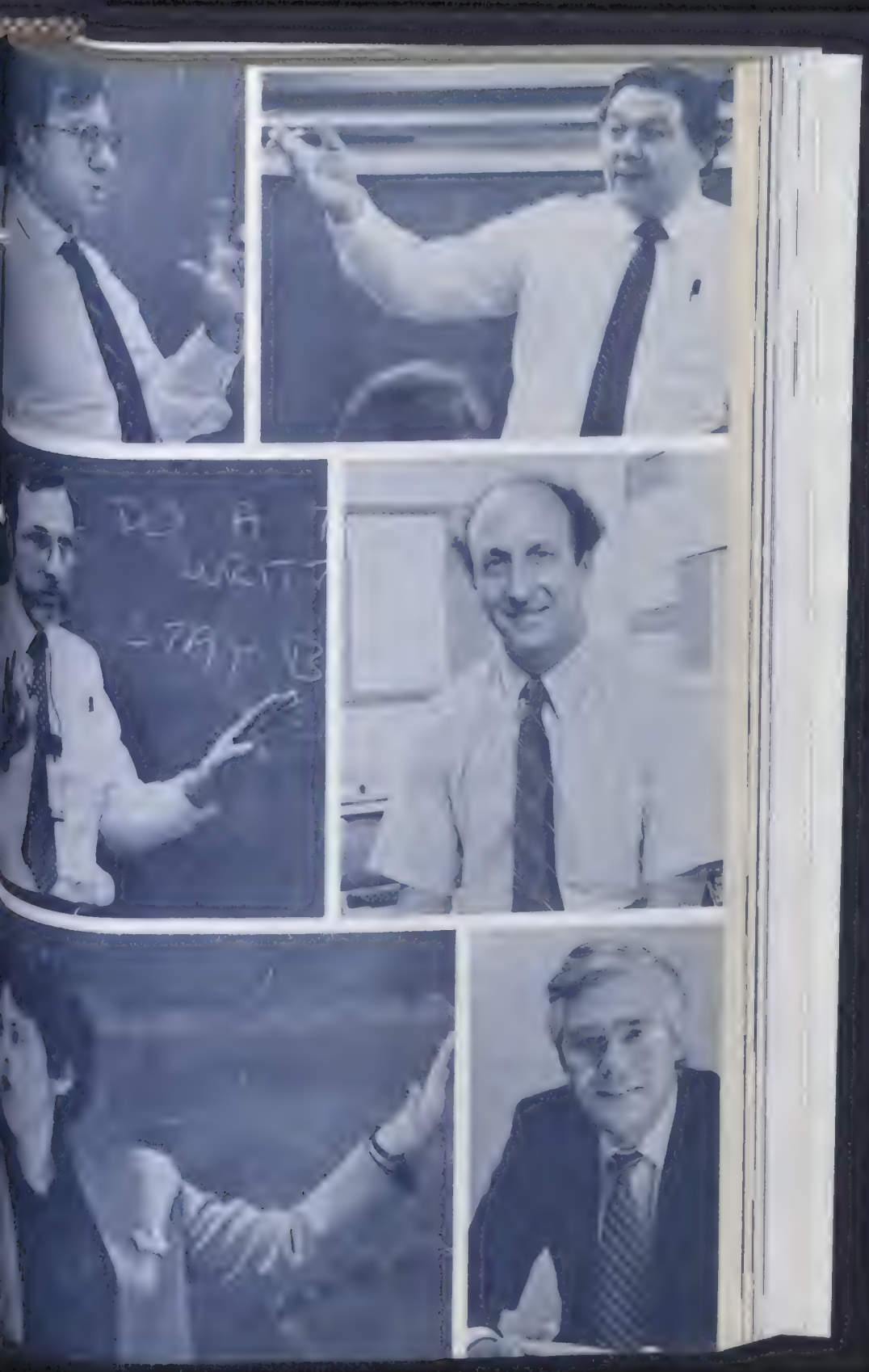
315 **Introduction to Nonlinear Mechanics of Continua** (3)
Polar decomposition, invariance, isotropy, representation theorems for invariants and isotropic tensor functions. Deformation, kinematics, stress, balance principles. Principles for constitutive relations. Applications to nonlinear elasticity and non-Newtonian fluids. Prerequisite: ApSc 212. (Spring, even years)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)


Electrical
Engineering
and
Computer Science
KOUNDS





# Electrical Engineering and Computer Science

***Professors*** R.B. Heller, W.K. Kahn, R.L. Pickholtz, M.F. Eisenberg, A.C. Meltzer, W.D. Maurer, A.D. Friedman, H.J. Helgert, R.H. Lang, J.D. Foley *(Chair)*, T.N. Lee, E. Della Torre, R. J. Harrington, L. J. Hoffman, O. N. Garcia, W. Wasylkiwskyj, N.A. Alexandridis, S.Y. Berkovich, M.B. Feldman, S.J. Raff *(Research)*, M.H. Loew

***Professorial Lecturers*** J.M. Aein, H.-L.A. Hung, A.A. Wolf, W.D. Jackson, W.T. Bisignani, P.J. Crepeau, S.H. Durrani, R.K. Khatri, C.E. Dunham, L.M. Leibowitz, P.M. Kelly, M. Mohajerbi, F. Dellon, J.R. Silverman, J.A. Knight, F.P. Pantuso, J.H. Scharen-Guivel, J. Foreman, M.H. Friedman, T.T. Nieh, C. Alexander, Jr., D.C. Roberts, G.J. Kowalski, A. Schneider, G.M. Borsuk, J. Donelson III

***Associate Professors*** N. Kyriakopoulos, R.L. Carroll, Jr., D.C. Rohlfs *(Director of Laboratories)*, J.L. Sibert, P.S. Bock, M.E. Zaghloul, D. B. Newman, Jr., N.S. Chauhan *(Visiting)*

***Adjunct Associate Professor*** B. Jabbari

***Associate Professorial Lecturers*** J.W. Benoit, A.S. Gill, W.W. Wu, C.-H.C. Wang, H. Carus, M.C. Chen, A.F. Manfredi, Jr., R.D. Angelari, J.C.-C. Hsing, G.R. Lawrence, J.W. Fussel, R.A. Herring, Jr., A.K. Mehrotra, P.A. Lamb, C.V. Stewart, R.R. Landberg, M.S. Gluck, S.H. Kaisler, D.R. Smith, A.L. Breitler, P.K. Wahi, H.I. Bassen, C.A. Eldridge, R.F. Rada, J.A. Lipkin, Y.-S. Fu, C.M. Waespy, J. Epstein, L.A. Fletcher

***Assistant Professors*** S. Rotenstreich, D. Saha, Z. Kitov *(Visiting)*, R.S. Heller, A.K. Kakaes, C.D. Martin, B. Narahari, H. Senay, L.H. Reuter, A. Youssef

***Assistant Professorial Lecturers*** F.M. Brosi, Jr., T.R. Husson, E.H. Neal, E.B. Leiderman, K.J. Schmucker, J.J. Seppy, J.S. Davies, Jr., C.E. McCullough, J.B. Bronder, C.E. Knadler, Jr., S.J. Koch, J.D. Kotulski, R.M. Tarakan, E.A. Walker, D.A.J. Eide, T. Nelson, R.M. Holland, P.P. Senyo, L.S. Finlayson, V.A. Marshall III, J.W. Sargent, M.F. D'Antonio, F.T. Khalatbari, M.C. McElvaney, Y.K. Park

***Lecturer*** E. Abramic

The undergraduate programs of study in the Department of Electrical Engineering and Computer Science lead to the degrees of Bachelor of Science (Electrical Engineering) and Bachelor of Science (Computer Science). In the electrical engineering program, options are available in computer engineering and premedical engineering.

## Electrical Engineering Undergraduate Study

Electrical engineering is concerned with the generation, transmission, control, and utilization of electricity as a source of energy and a medium of communication. Electrical engineers design generators that produce electrical energy, transmission networks that carry this power to homes and factories, and motors that use it to drive machinery. They harness electromagnetic radiation to produce radio waves for the propagation of radio and television signals and the transmission of information via satellites, and design the electronic circuits used in communications equipment and computers. Electrical engi-

neers are now developing instrumentation to assist the medical profession in understanding the causes of disease and to aid in enhancing the quality of and prolonging life.

Because the world's primary energy sources are limited, electrical power is an important resource. The production of electricity from nuclear power and control of nuclear power plants is of growing concern to electrical engineers, and they are involved in research to produce electrical energy directly from solar power.

Electrical engineering is a discipline in which practical, theoretical, and scientific aspects are integrated. Analysis, synthesis, and design go hand in hand. The electrical engineering curriculum provides the student with such an integrated approach. The first two years of the curriculum are common to all undergraduate fields in the School and allow students to develop a sound foundation of basic and engineering sciences. At the beginning of the third year, students decide whether they will follow the regular electrical engineering curriculum or concentrate in computer or premedical engineering.

The Department of Electrical Engineering and Computer Science has modern laboratory equipment, including its own computers. The student has an opportunity during the last year to work on individual projects in areas such as computers, communications, microwaves, controls, electronics, medical engineering, and circuits.

Course schedules have been arranged to accommodate full-time, part-time, and cooperative education students. Undergraduate courses are offered once a year during the day for full-time students and once every two years in the evening for part-time students.

## Subject Areas

### *Communications*

EE 143: Elements of Communications Engineering Design I
EE 144: Elements of Communications Engineering Design II
EE 146: Communications Design Laboratory

### *Computer Engineering*

CSci 51: Introduction to Computing
CSci 53: Computers and Society
CSci 56: FORTRAN Programming
CSci 147: Assembly Language Programming I
CSci 150: Introduction to Microcomputers
CSci 151: Systems Software and Software Engineering
CSci 153: Design of Switching Systems
CSci 154: Digital Computer Design
CSci 155: Introduction to Numerical Methods for Computers
CSci 156: Introduction to Operating Systems
CSci 157: Assembly Language Programming II
CSci 158: Algorithmic Methods
CSci 159: Programming and Data Structures
CSci 161: Discrete Structures for Computing
CSci 163: Senior Computer Science Project Laboratory I
CSci 164: Senior Computer Science Project Laboratory II
CSci 166: Computer Science Laboratory I
CSci 167: Computer Science Laboratory II

### *Controls, Systems, and Power*

EE 166: Electrical Power Laboratory I
EE 172: Control Systems Design
EE 176: Control Systems Laboratory
EE 177: Electrical Energy Conversion
EE 178: Electrical Power Systems

### *Electronics*

EE 20: Introductory Engineering Electronics
EE 121: Engineering Electronics and Design
EE 122: Digital Electronics and Design
EE 124: Electronic Devices
EE 126: Introduction to VLSI Design and Simulation
EE 127: VLSI Fabrication Techniques
EE 128: Testing and Simulation of VLSI Circuits
EE 169: Advanced Electronics Design Laboratory

### *Fields and Waves*

EE 31: Fields and Waves I
EE 32: Fields and Waves II
EE 133: Electromagnetic Waves and Microwave Systems Design
EE 168: Microwave and Laser Engineering Laboratory

### *Laboratories and Measurement*

CSci 163: Senior Computer Science Project Laboratory I
CSci 164: Senior Computer Science Project Laboratory II
EE 63: Instrumentation and Networks Laboratory
EE 65: Solid-State Devices Laboratory
EE 66: Digital Electronics Design Laboratory
EE 67: Switching Circuits Laboratory
EE 163: Senior Electrical Engineering Project Laboratory I
EE 164: Senior Electrical Engineering Project Laboratory II

### *Medical Engineering*

EE 184: Medical Engineering Instrumentation and Systems Design
EE 186: Medical Engineering Laboratory

### *Networks*

EE 11: Linear Networks I
EE 12: Linear Networks II
EE 113: Network Analysis and Design
EE 116: Introduction to Network Synthesis

## Core Curriculum

Normally the first four semesters are common to all electrical engineering undergraduate degree programs and to undergraduate fields in other departments of the School of Engineering and Applied Science.

### First Semester

BiSc 11: Introductory Biology for Science Majors (4) (pre-med option only)
CSci 51: Introduction to Computing (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Math 31: Single-Variable Calculus I (3)
Phys 13: General Physics for Engineering and Applied Science (3)
Elective: Selected from humanities or social sciences (3) (except pre-med option)

### Second Semester

BiSc 12: Introductory Biology for Science Majors (4) (pre-med option only)
Chem 13: General Chemistry (4)
CSci 53: Computers and Society (2)
CSci 56: FORTRAN Programming (1)
Math 32: Single-Variable Calculus II (3)
Phys 14: Mechanics and Thermal Physics (3)
Elective: Selected from humanities or social sciences (3) (except pre-med option)

### Third Semester

ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
ApSc 115: Engineering Analysis III (3)
Math 33: Multivariable Calculus (3)
Phys 15: Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

### Fourth Semester

ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
CE 140: Materials Science (3) (except computer engineering option)
Chem 22 and 23: Introductory Quantitative Analysis (3) and Laboratory (2) (pre-med option only)
CSci 161: Discrete Structures for Computing (3) (computer engineering option only)
EE 11: Linear Networks I (3)
Phys 16: Modern Physics (3)
Elective: Selected from humanities or social sciences (3) (except pre-med option)

## Electrical Engineering Curriculum

### Fifth Semester

CSci 147: Assembly Language Programming I (3)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Solid-State Devices Laboratory (1)
Elective: Selected from humanities or social sciences (3)

### Sixth Semester

CSci 153: Design of Switching Systems (3)
EE 32: Fields and Waves II (3)
EE 66: Digital Electronics Design Laboratory (1)
EE 67: Switching Circuits Laboratory (1)
EE 122: Digital Electronics and Design (3)
EE 177: Electrical Energy Conversion (3)
Elective: Selected from humanities or social sciences (3)

### Seventh Semester

EE 121: Engineering Electronics and Design (3)
EE 143: Elements of Communications Engineering Design I (3)
EE 163: Senior Electrical Engineering Project Laboratory I (2)
Elective: Technical electives (9)—three courses selected from ApSc 199; EE 113, 126, 127, 133, 178; CSci 150, 155; ME 131, 187
Elective: One laboratory (1 credit) selected from EE 146, 166, 169

### Eighth Semester

EE 144: Elements of Communications Engineering Design II (3)
EE 164: Senior Electrical Engineering Project Laboratory II (2)
EE 172: Control Systems Design (3)
Elective: Technical electives (5)—two courses selected from ApSc 199; EE 116, 124, 128, 160, 184; ME 194
Elective: One laboratory (1 credit) selected from EE 166, 168, 176, 186

### Technical Electives

ApSc 199: Honors Research Project and Seminar (3)
CSci 150: Introduction to Microcomputers (3)
CSci 155: Introduction to Numerical Methods for Computers (3)
EE 113: Network Analysis and Design (3)
EE 116: Introduction to Network Synthesis (3)
EE 124: Electronic Devices (3)
EE 126: Introduction to VLSI Design and Simulation
EE 127: VLSI Fabrication Techniques
EE 128: Testing and Simulation of VLSI Circuits
EE 133: Electromagnetic Waves and Microwave Systems Design (3)
EE 146: Communications Design Laboratory (1)
EE 160: Electrical Measurements and Instrumentation (3)
EE 166: Electrical Power Laboratory I (1)
EE 168: Microwave and Laser Engineering Laboratory (1)
EE 169: Advanced Electronics Design Laboratory (1)
EE 176: Control Systems Laboratory (1)
EE 178: Electrical Power Systems (3)
EE 184: Medical Engineering Instrumentation and Systems Design (3)
EE 186: Medical Engineering Laboratory (1)
ME 131: Thermodynamics (3)
ME 187: Heat Transfer (3)
ME 194: Energy Conversion (3)

***Note:*** Students may also elect appropriate graduate courses with the permission of their advisers.

## Computer Engineering Option

Computer engineering is a developing discipline that combines electronic design, programming of computers, and mathematics into a comprehensive area. The student learns the design and use of computers for scientific and business applications. Students who complete this option will be able to design both hardware and software for minicomputers and large-scale computing systems. The student will also be able to use computer hardware and software for control of large systems. The curriculum prepares the student to begin a career in computer design, applications, and use or to pursue graduate study.

The program of study for the first four semesters is the same as that outlined in the electrical engineering core curriculum, above.

### *Fifth Semester*

CSci 147: Assembly Language Programming I (3)
CSci 159: Programming and Data Structures (3)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Solid-State Devices Laboratory (1)

### *Sixth Semester*

CSci 153: Design of Switching Systems (3)
CSci 158: Algorithmic Methods (3)
EE 32: Fields and Waves II (3)
EE 66: Digital Electronics Design Laboratory (1)
EE 67: Switching Circuits Laboratory (1)
EE 122: Digital Electronics and Design (3)
Elective: Selected from humanities or social sciences (3)

### *Seventh Semester*

CSci 150: Introduction to Microcomputers (3)
CSci 155: Introduction to Numerical Methods for Computers (3)
CSci 156: Introduction to Operating Systems (3)
CSci 163: Senior Computer Science Project Laboratory I (2)
CSci 166: Computer Science Laboratory I (1)
Elective: Technical elective (3)—selected from EE 113, 121, 126, 127, 133, 143
Elective: Selected from humanities or social sciences (3)

### *Eighth Semester*

CSci 151: System Software and Software Engineering (3)
CSci 154: Digital Computer Design (3)
CSci 164: Senior Computer Science Project Laboratory II (2)
CSci 167: Computer Science Laboratory II (1) or EE 176: Control Systems Laboratory (1)
EE 172: Control Systems Design (3)
Elective: Technical elective (3)—selected from EE 124, 128, 144, 177, 184

### Technical Electives

ApSc 199: Honors Research Project and Seminar (3)
EE 113: Network Analysis and Design (3)
EE 121: Engineering Electronics and Design (3)
EE 124: Electronic Devices (3)
EE 126: Introduction to VLSI Design and Simulation (3)
EE 127: VLSI Fabrication Techniques (3)
EE 128: Testing and Simulation of VLSI Circuits (3)
EE 133: Electromagnetic Waves and Microwave Systems Design (3)
EE 143: Elements of Communications Engineering Design I (3)
EE 144: Elements of Communications Engineering Design II (3)
EE 177: Electrical Energy Conversion (3)
EE 184: Medical Engineering Instrumentation and Systems Design (3)

## Premedical Engineering Option

The premedical engineering option permits the student to obtain a bachelor's degree in engineering and have sufficient preparation to apply to a medical school for study toward the Doctor of Medicine degree. The student will also have sufficient background to work in various allied health fields and in the research and development of new electronic equipment used in medicine or to continue as a graduate student in engineering with exceptional qualifications for medical engineering.

The program of study for the first four semesters is the same as that outlined in the electrical engineering core curriculum, above.

### Fifth Semester

Chem 151: Organic Chemistry (3)
Chem 153: Organic Chemistry Laboratory (1)
CSci 147: Assembly Language Programming I (3)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Solid-State Devices Laboratory (1)

### Sixth Semester

Chem 152: Organic Chemistry (3)
Chem 154: Organic Chemistry Laboratory (1)
CSci 153: Design of Switching Systems (3)
EE 32: Fields and Waves II (3)
EE 66: Digital Electronics Design Laboratory (1)
EE 67: Switching Circuits Laboratory (1)
EE 122: Digital Electronics and Design (3)
Elective: Selected from humanities or social sciences (3)

### Seventh Semester

EE 121: Engineering Electronics and Design (3)
EE 143: Elements of Communications Engineering Design I (3)
EE 163: Senior Electrical Engineering Project Laboratory I (2)
EE 169: Advanced Electronics Design Laboratory (1)
Elective: Technical elective (3)
Elective: Selected from humanities or social sciences (6)

### Eighth Semester

EE 164: Senior Electrical Engineering Project Laboratory II (2)
EE 172: Control Systems Design (3)
EE 184: Medical Engineering and Systems Design (3)
EE 186: Medical Engineering Laboratory (1)
Elective: Technical elective (3)
Elective: Selected from humanities or social sciences (6)

### Technical Electives

ApSc 199: Honors Research Project and Seminar (3)
Bioc 221–22: General Biochemistry (4–4)
BiSc 145: Principles of Development (4)
BiSc 148: Histology (4)
EE 144: Elements of Communications Engineering Design II (3)

## Electrical Engineering Undergraduate Courses

The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

3 **Electronics for Nonengineers I** (3)
Introduction to the basic theory and practical applications of modern electronics, with emphasis on material of value to the nontechnical individual in an increasingly technological society. Topics include basic electrical theory, solid-state devices, amplifiers and other electronic circuits, instrumentation, communications, and microcomputer circuits. May not be taken for credit by students in SEAS. (Fall) (Eisenberg)

11 **Linear Networks I** (3)
Signals and waveforms, average value and RMS, network concepts, elements, and parameters. Kirchhoff's laws, simple networks, energy and power, differential equations of networks and their solution, phasors and steady-state analysis, measurements, impedance concepts, resonance, and filtering. Prerequisite: Phys 15, ApSc 113. (Spring—day and evening; Fall—evening) (Zaghloul)

12 **Linear Networks II** (3)
Singular functions; Laplace transform; network functions, poles and zeros; total response; time and frequency domains; convolution theorems; Fourier analysis, spectra; frequency response, Bode plots; two-port parameters. Prerequisite: ApSc 114, EE 11. (Fall—day and evening; Spring—evening) (Zaghloul)

20 **Introductory Engineering Electronics** (3)
Various types of solid-state devices used in electronic engineering considered from the point of view of the physics of their operation and from the engineering point of view of their application to electronic circuits. Primary emphasis on application of these elements in power supplies and in linear amplifiers. Introduction of design concepts through use of SPICE, MICRO-CAP II, and graphical techniques. Prerequisite: EE 11. (Fall—day and evening; Spring—evening) (Heller)

31 **Fields and Waves I** (3)
Vector calculus, orthogonal coordinates, Coulomb and Gauss laws, scalar potential, dipoles, method of images, dielectrics, capacitance, steady currents, Laplace and Poisson equations, boundary–value problems. Prerequisite: Phys 15, 16; ApSc 113. (Fall—day; Fall, even years—evening) (Kahn)

**32 Fields and Waves II** (3)
Biot–Savart law, Ampere law, vector potential, magnets, Faraday law. Maxwell equations, plane waves, and Poynting vector. Prerequisite: ApSc 114, EE 31. (Spring—day; Spring, odd years—evening) (Kahn)

**63 Instrumentation and Networks Laboratory** (1)
Use of standard laboratory electronic instruments in the measurement of electrical and electronic components and networks. Verification of network laws and theorems. Characteristics and limitations of instruments. Application of instruments to measure voltage, current, resistance, impedance power, time, period, and frequency. Use of digital multimeter, frequency counter, function generator, and oscilloscope to measure steady-state and transient phenomena. Prerequisite or concurrent registration: EE 12, 20 (Fall—day and evening; Spring—evening) (Rohlfs)

**65 Solid-State Devices Laboratory** (1)
Testing and measurement of the characteristics of solid-state devices used in electronic systems: diodes, BJTs, FETs, SCRs, timers, op amps, and ICs. applications. Design and measurement of the characteristics of power supplies, BJT and FET amplifier circuits, clipping and clamping circuits, power control circuits, and timing circuits. Prerequisite or concurrent registration EE 12, 20, 63. (Fall—day and evening; Spring—evening) (Rohlfs)

**66 Digital Electronics Design Laboratory** (1)
Characteristics of electronic devices used in switching, sweeping, and waveforming circuits. Generation of waveforms. Digital storage devices and sequential circuits. Characteristics of different methods to produce binary logic gates. Characteristics of integrated circuits. Prerequisite: EE 65; prerequisite or concurrent registration: EE 122. (Spring—day and evening. Fall—evening) (Rohlfs)

**67 Switching Circuits Laboratory** (1)
Analysis and design of combinational and sequential switching circuits using integrated circuits. Design of decoders, adders, counters, shift registers, character generators, and arithmetic circuits. Prerequisite or concurrent registration: EE 66, CSci 153. (Spring—day and evening. Fall—evening) (Rohlfs)

**111 Circuits and Electronics** (3)
Introduction to electrical circuit theory and analog electronic circuits for students in computer science. Topics include electrical-quantities circuit principles, network theorems, waveforms, impedance concepts, circuit response, network analysis, two-part networks, diode circuits, transistor circuits, operational amplifiers, biasing circuits, small-signal amplifiers, multistage amplifiers. Prerequisite: Phys 15, ApSc 113. (Fall and Spring) (Meltzer)

**112 Digital Electronics** (3)
Continuation of the study of electronic circuits for students in computer science. Topics include diode characteristics, diode switches, diode logic gates, transistor switching characteristics, transistor switches, transistor gates, mode–transistor gates, transistor–transistor gates, transistor–transistor logic, emitter-coupled logic, MOS gates, flip-flop circuits, clocked flip-flops, counters and registers, memory system, PROMS, DERAMS, EAPROMS, RAM, analog-to-digital conversion. Prerequisite: EE 111. (Fall and Spring) (Meltzer)

**113 Network Analysis and Design** (3)
Applications of matrix theory and linear graphs to electrical network analysis; network equations; signal-flow graphs; introduction to state-space techniques; solution of state-space equations on a digital computer. Network transfer functions; properties of active networks, including reciprocity, stability, activity, and feedback. Use of network analysis programs such as ECAP. Prerequisite: EE 12, 20. (Fall—day; Fall, even years—evening) (Lee)

116 **Introduction to Network Synthesis** (3)
Network functions and their properties. Positive real functions and testing for this property. Two-element, one-port network synthesis; RLC one-port synthesis; the approximation problem in the frequency domain; modern filter theory and design; two-port ladder and lattice synthesis. Introduction to digital filters; truncation errors; realization techniques. Prerequisite: EE 113. (Spring—day; Spring, odd years—evening) (Lee)

121 **Engineering Electronics and Design** (3)
Graphical analysis and design beyond the level covered in EE 20. Design of push–pull, direct-coupled, and class B and C amplifiers. Design of operational amplifiers; use in filters and electronic systems. Design of oscillators, active filters, modulators, and demodulators.Use of SPICE and MICRO-CAP II in design. Prerequisite: EE 12, 20. (Fall—day and evening) (Heller)

122 **Digital Electronics and Design** (3)
Introduction to and design of large signal circuits used in computers and communications systems. Design of logic gates and flip-flops. Concepts in integrated circuit design. Design of counting and timing circuits using ICs. Pulse, sweep, and wave-shaping circuits. Prerequisite: EE 12, 20. (Spring—day and evening) (Eisenberg)

124 **Electronic Devices** (3)
Principles of operation of electronic devices used in electrical networks, communication systems, and electronic circuits. Properties of surface acoustic wave electronic devices and their applications. Modeling of devices such as diodes, transistors, charge-coupled devices, and lasers. Fabrication methods of discrete components and integrated circuits. Prerequisite: EE 32, 121; Phys 16. (Spring—day; Spring, odd years—evening) (Heller)

126 **Introduction to VLSI Design and Simulation** (3)
Introduction to the theory and use of a CAD/CAM system for the design of VLSI circuits. Topics include stick diagramming, NMOS transistors, switch and gate logic, PLAs, finite-state machines, master-slice techniques, design rules for the CAD system, speed and power considerations, floor planning, layout techniques. The student will design a VLSI circuit using the CAD computer and simulate the design. May be taken for graduate credit. Prerequisite: CSci 147, 153; EE 122 or equivalent. (Fall) (Zaghloul)

127 **VLSI Fabrication Techniques** (3)
Choice of circuit technologies, process technologies associated with various types of components, different chip architectures, master-slice techniques, gate arrays, standard cell, PLA. Fabrication of VLSI, two basic MOS technologies and other available technologies, oxidation, photoengraving, chemical etching, diffusion. May be taken for graduate credit. Prerequisite: CSci 147, 153; EE 122. (Spring) (Zaghloul)

128 **Testing and Simulation of VLSI Circuits**
Continuation of EE 126, principally for the testing of VLSI circuits that have been designed and fabricated. Topics include testing techniques and use of the VLSI system-testing laboratory. Design for testability techniques and design of a testable system. Simulation techniques used in the design of VLSI circuits. Static tests, dynamic testing, functional testing. Students must test the circuits previously designed. May be taken for graduate credit. Prerequisite: EE 126. (Spring) (Zaghloul)

131 **Computer Science Hardware Laboratory I** (1)
For students in computer science. Use of electronic instruments for the measurement of electronic components. Characteristics of laboratory instruments. Applications for the measurement of voltage, current, resistance, impedance, period, and frequency. Measurements of electronic devices, such as translators and amplifiers. Prerequisite: EE 111. (Fall) (Meltzer)

132 **Computer Science Hardware Laboratory II** (1)
For students in computer science. Analysis and design of combinational and sequential circuits using integrated circuits. Analysis of two-level logic,

decoders, adders. Design of counters, shift registers, arithmetic units, and memory systems. Prerequisite: EE 111, 112; CSci 153. (Spring) (Meltzer)

133 **Electromagnetic Waves and Microwave Systems Design** (3)
Time-harmonic Maxwell equations, complex Poynting vector, transmission lines, characteristics of common waveguides, resonant cavities. Smith chart, design of coaxial and waveguide systems, Lorentz reciprocity, simple antennas, design of linear antenna arrays. Prerequisite: EE 32. (Fall—day; Fall, even years—evening) (Kahn)

143 **Elements of Communications Engineering Design I** (3)
Signal analysis; Fourier transforms, power spectrum; principles of modulation, amplitude, frequency, and pulse modulation. Comparison of analog and digital transmission. Time and frequency division multiplexing. Random signals and noise. Transmission systems for cable, radio, satellite, and optical links. Prerequisite: ApSc 114 or permission of course director; prerequisite or concurrent registration: EE 121. (Fall—day and evening) (Newman)

144 **Elements of Communications Engineering Design II** (3)
Statistical theory of communications. Comparison of communications systems in noisy channels. Data communications, design of modems. Concept of information theory. Coding for noisy channels. ARQ and forward error control. Communications protocols. Elements of traffic theory. Special topics and student project. Prerequisite: EE 143 or permission of course director. May be taken for graduate credit by graduate students who are not majoring in communications. (Spring—day and evening) (Newman)

146 **Communications Design Laboratory** (1)
Experiments in support of the analysis and design of communications systems. Characteristics of real-time communication signals. Spectrum analyzer verification of waveforms. Analysis and design of encoding and decoding amplitude-modulation (AM) and frequency-modulation (FM) circuits; frequency conversion, frequency and time-division multiplexing, and digital communication circuits—continuously variable slope delta modulation (Delta) and pulse-code modulation (PCM). Prerequisite or concurrent registration: EE 32, 67, 121, 143; CSci 153. (Fall—day and evening) (Rohlfs)

160 **Electrical Measurements and Instrumentation** (3)
Electrical measurement from direct current through high radio frequencies. Measurements of current, voltage, power, resistance, capacitance, inductance, energy, phase angle, frequency, and time. Measurements of high-frequency signals including field strength, signal-to-noise ratio, impedance, and attenuation. Analog-to-digital conversion techniques and digital instrumentation for the control of measurement and instrumentation systems. Transducer characteristics and analog signal processing instrumentation. Laboratory demonstrations of measurements and instrumentation techniques. Prerequisite: EE 12, 32, 121; CSci 150. (Spring—evening) (Heller)

163 **Senior Electrical Engineering Project Laboratory I** (2)
Conception and design of a one-year project to be completed in EE 164. Performance of a market survey and economic analysis of the product. Completion of the preliminary design. Prerequisite: EE 67 and senior status; prerequisite or concurrent registration: EE 122, 143. (Fall—day and evening) (Meltzer)

164 **Senior Electrical Engineering Project Laboratory II** (2)
Completion and construction of the project started in EE 163. Oral and written presentation of the product designed. Prerequisite: EE 163. (Spring—day and evening) (Meltzer)

166 **Electrical Power Laboratory I** (1)
Experiments in support of the analysis and design of electrical power systems. Measurements of the characteristics of devices to generate electricity. Rectification and inversion processes for power systems and drives. Prerequisite or concurrent registration: EE 67, 177. (Fall and Spring—day and evening) (Harrington)

168 **Microwave and Laser Engineering Laboratory** (1)
Experiments in support of analysis and design of transmission lines, microwave components, microwave systems, fiber-optic systems, antennas and antenna arrays. Introduction to the characteristics of laser and optical systems. Prerequisite: EE 67, 133, 143. (Spring—day and evening) (Kahn)

169 **Advanced Electronics Design Laboratory** (1)
Experiments in support of the theory of the analog operation of electronic devices. Characteristics of nonlinear operation of electronic devices. Use of electronic devices in communication equipment. May be taken for graduate credit by graduate students who are not majoring in energy conversion, power, and transmission. Prerequisite: EE 32, 67; prerequisite or concurrent registration: EE 121, 122. (Fall—day and evening) (Heller)

172 **Control Systems Design** (3)
Mathematical models of linear systems; steady-state and transient analyses; root locus and frequency response methods; synthesis of linear feedback control systems. Prerequisite: ApSc 114, EE 12 or ME 134. (Spring—day and evening) (Carroll)

176 **Control Systems Laboratory** (1)
Experiments in support of control theory, involving the use of the digital computer for process control in real time. Design of feedback and compensation with computer implementation. Digital simulation of linear and nonlinear systems. Prerequisite or concurrent registration: EE 67, 172 or equivalent. (Spring—day and evening) (Carroll)

177 **Electrical Energy Conversion** (3)
Fundamentals of electromechanical energy conversion. Electromechanical transducers and their equivalent circuits, three-phase and single-phase AC rotating machines, DC machines, rotating machines as circuit elements. Prerequisite: EE 12, 31. (Fall and Spring—day; Spring, even years—evening) (Harrington)

178 **Electrical Power Systems** (3)
Introduction to electrical power systems; transmission and distribution of electrical power, three-phase circuits, symmetrical components, fault analysis. Voltage, current, and power restrictions and limitations. Analysis of lightning and switching surges in power systems. Protective devices—switchgear, arresters, and isolators. May be taken for graduate credit. Prerequisite: EE 177 and senior status. (Fall—evening) (Harrington)

184 **Medical Engineering Instrumentation and Systems Design** (3)
Introduction to the applications of engineering design in the medical sciences. Terminology of the medical profession; physiology of the human body, from overall systems or functional approach; survey of present-day medical measurements and consideration of those areas in which engineering design may be applied advantageously to medicine. May be taken for graduate credit except by medical engineering majors. (Spring—evening) (Eisenberg)

186 **Medical Engineering Laboratory** (1)
Experiments in support of instrumentation used in medicine and biology; safety considerations. Acquisition and measurement of physiological signals, EKG, EEG, evoked potentials. Processing of signals derived from physiological measurements. Concepts in telemetry of medical signals. Prerequisite or concurrent registration: EE 12, 32, 66, 121, 184. (Spring—day and evening) (Loew)

197 **Special Topics in Electrical Engineering** (1 to 3)
Topic to be announced in the *Schedule of Classes*. (Fall and Spring)

198 **Research** (1 to 3)
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

## Computer Science Undergraduate Study

The Department of Electrical Engineering and Computer Science offers a program of study leading to the degree of Bachelor of Science (Computer Science).

Computer science is the study of the computer's physical attributes, or hardware, and the methods of its use, or software. The undergraduate curriculum combines systems design, computer programming, and mathematics to give the student a broad background in the fundamentals of computer science. Students who complete the program will be able to design the hardware and software needed for both large computing systems and small microprocessor-based systems. The curriculum prepares students for graduate school, for careers in computer or software design, and for work with the applications of computers.

Widespread use of the digital computer has caused great changes in virtually every area of human endeavor involving data generation, collection, analysis, reduction, and display. Business, economic, legal, educational, scientific, military, political, and humanitarian organizations have all benefited in some way by using computers. Careers are available in every area related to computer science, including designing, testing, operating, installing, programming, maintaining, instructing, and buying and selling computers and related equipment. Faculty members in the department have research interests that include time-sharing systems, information systems, associative memories and processors, simulation, artificial intelligence, robotics, programming languages, automata theory, interactive computer graphics, human factors of the human–machine interface, microprocessors, distributed processing and networking, fault-tolerant design, security and privacy, correctness of programs, analysis of algorithms, database systems, cartography, and spectral analysis.

Qualified undergraduate students may participate in faculty research through the Honors Research Program. Students admitted to that program are assigned to selected computer science faculty for academic advising and guidance. They are afforded the opportunity to participate in specially designed research projects and in related seminars.

In addition, a limited number of undergraduate students may become research assistants, and summer employment as an assistant to a faculty member conducting research may be available.

## Subject Area

CSci 10: Word Processing, Filing, and Spreadsheet Systems
CSci 11: Microcomputer DBMS, Charting, and Ledger Systems
CSci 30: Computer Literacy
CSci 51: Introduction to Computing
CSci 53: Computers and Society
CSci 100: Introduction to Programming
CSci 132: Theoretical Foundations of Computing
CSci 147: Assembly Language Programming I
CSci 150: Introduction to Microcomputers
CSci 151: System Software and Software Engineering
CSci 153: Design of Switching Systems
CSci 154: Digital Computer Design
CSci 155: Introduction to Numerical Methods for Computers
CSci 156: Introduction to Operating Systems
CSci 157: Assembly Language Programming II
CSci 158: Algorithmic Methods

CSci 159: Programming and Data Structures
CSci 161: Discrete Structures for Computing
CSci 171: Computational Methods for Simulation
CSci 173: Theory of Computer Translators
CSci 174: Symbolic and Logic Processing for Artificial Intelligence
CSci 177: Programming for Management Systems
CSci 178: Introduction to Database Management
CSci 185: Interactive Computer Graphics I
CSci 188: Distributed Computing Systems
EE 111: Circuits and Electronics
EE 112: Digital Electronics

## Laboratories

CSci 54: Programming Laboratory
CSci 121: Software Laboratory I
CSci 122: Software Laboratory II
CSci 163: Senior Computer Science Project Laboratory I
CSci 164: Senior Computer Science Project Laboratory II
CSci 166: Computer Science Laboratory I
CSci 167: Computer Science Laboratory II
EE 131: Computer Science Hardware Laboratory I
EE 132: Computer Science Hardware Laboratory II

## Computer Science Curriculum

The first four semesters of the curriculum include core courses in science, mathematics, and computer science as well as study in English, the humanities, and the social sciences. During the last four semesters, the student must choose an application elective track, which provides the opportunity to concentrate in an area to which computers may be applied. The following application elective tracks are offered: computer-aided design, digital electronics and hardware, engineering administration, financial systems, management decision systems, management information systems, mathematics, and operations research.

During the sixth, seventh, and eighth semesters, students select free electives, in consultation with their adviser, in a nontechnical area to broaden their general education. Students are encouraged to select these courses from the humanities, social sciences, communication skills, or other disciplines.

## Core Curriculum

### *First Semester*

CSci 51: Introduction to Computing (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Math 31: Single-Variable Calculus I (3)
Phys 13: General Physics for Engineering and Applied Science (3)
Elective: Selected from humanities or social sciences (3)

### *Second Semester*

CSci 53: Computers and Society (2)
CSci 54: Programming Laboratory (1)
CSci 147: Assembly Language Programming I (3)
Math 32: Single-Variable Calculus II (3)
Phys 14: Mechanics and Thermal Physics (3)
Elective: Selected from humanities or social sciences (3)

### *Third Semester*

ApSc 113: Engineering Analysis I (3)
CSci 159: Programming and Data Structures (3)
CSci 161: Discrete Structures for Computing (3)
Math 33: Multivariable Calculus (3)
Phys 15: Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

### *Fourth Semester*

ApSc 115: Engineering Analysis III (3)
Chem 13: General Chemistry (4)
CSci 132: Theoretical Foundations of Computing (3)
CSci 153: Design of Switching Systems (3)
CSci 158: Algorithmic Methods (3)

## Curriculum for Digital Electronics and Hardware Application Elective Track

A student selecting the Digital Electronics and Hardware Application Elective Track must complete the following curriculum, which includes 13 credit hours of application electives. Students admitted to the Honors Research Program may substitute ApSc 199 for one three-credit course, chosen in consultation with their adviser.

### *Fifth Semester*

CSci 121: Software Laboratory I (1)
CSci 150: Introduction to Microcomputers (3)
CSci 155: Introduction to Numerical Methods for Computers (3)
CSci 173: Theory of Computer Translators (3)
EE 111: Circuits and Electronics (3) (application elective)
EE 131: Computer Science Hardware Laboratory I (1) (application elective)
Engl 110: Writing in Engineering and the Sciences (3)

### *Sixth Semester*

CSci 122: Software Laboratory II (1)
CSci 154: Digital Computer Design (3)
CSci 156: Introduction to Operating Systems (3)
CSci 171: Computational Methods for Simulation (3)
EE 112: Digital Electronics (3) (application elective)
EE 132: Computer Science Hardware Laboratory II (1) (application elective)
Elective: Selected from humanities or social sciences (3)

### *Seventh Semester*

CSci 151: System Software and Software Engineering (3)
CSci 163: Senior Computer Science Project Laboratory I (2)
CSci 166: Computer Science Laboratory I (1) (application elective)
CSci 177: Programming for Management Systems (3)
*or*
CSci 185: Interactive Computer Graphics I (3)
CSci 188: Distributed Computing Systems (3) (application elective)
Elective: Selected from humanities or social sciences (3)
Elective: Free elective (nontechnical) (3)

### Eighth Semester

CSci 164: Senior Computer Science Project Laboratory II (2)
CSci 167: Computer Science Laboratory II (1) (application elective)
CSci 174: Symbolic and Logic Processing for Artificial Intelligence (3)
CSci 178: Introduction to Database Management (3)
Elective: Selected from humanities or social sciences (3)
Elective: Free electives (nontechnical) (6)

## Curriculum for Other Application Elective Tracks

A student who does not wish to follow the Digital Electronics and Hardware Application Elective Track Curriculum must choose one of the other application elective tracks listed below and complete the following curriculum. Students admitted to the Honors Research Program may substitute ApSc 199 for one three-credit course, chosen in consultation with their adviser.

### Fifth Semester

CSci 121: Software Laboratory I (1)
CSci 150: Introduction to Microcomputers (3)
CSci 155: Introduction to Numerical Methods for Computers (3)
CSci 173: Theory of Computer Translators (3)
Engl 110: Writing in Engineering and the Sciences (3)
Elective: Application elective selected from chosen track (3)

### Sixth Semester

CSci 122: Software Laboratory II (1)
CSci 154: Digital Computer Design (3)
CSci 156: Introduction to Operating Systems (3)
CSci 171: Computational Methods for Simulation (3)
Elective: Application elective selected from chosen track (3)
Elective: Selected from humanities or social sciences (3)
Elective: Free elective (nontechnical) (3)

### Seventh Semester

CSci 151: System Software and Software Engineering (3)
CSci 163: Senior Computer Science Project Laboratory I (2)
CSci 177: Programming for Management Systems (3)
*or*
CSci 185: Interactive Computer Graphics I (3)
Elective: Application elective selected from chosen track (3)
Elective: Selected from humanities or social sciences (3)
Elective: Free elective (nontechnical) (3)

### Eighth Semester

CSci 164: Senior Computer Science Project Laboratory II (2)
CSci 174: Symbolic and Logic Processing for Artificial Intelligence (3)
CSci 178: Introduction to Database Management (3)
Elective: Application elective selected from chosen track (3)
Elective: Selected from humanities or social sciences (3)
Elective: Free elective (nontechnical) (3)

## Other Application Elective Tracks

A student must choose an application elective track from those listed below and complete 12 credit hours in the track selected.

### *Computer-Aided Design*

EngS 282: Computer-Aided Design (3)
EngS 283: Application of Computer Graphics in Engineering (3)
EngS 284: Numerical Methods in Engineering (3)
EngS 285: Finite Element Methods in Engineering Mechanics (3)

### *Engineering Administration*

EAd 150: Introduction to Engineering Administration (3)
EAd 160: Introduction to Engineering Economic Analysis (3)
EAd 170: Basic Quantitative Methods of Engineering Administration (3)
EAd 211: Engineering Administration (3)

### *Financial Systems*

Acct 51: Introductory Financial Accounting (3)
Acct 52: Introductory Managerial Accounting (3)
BAd 120: Business Finance (3)
BAd 123: Investment and Portfolio Management (3)

### *Management Decision Systems*

BAd 140: Basic Marketing Management (3)
BAd 183: Logistics Management (3)
BAd 188: Managing Production/Operations (3)
BAd 191: Fundamentals of Management (3)

### *Management Information Systems*

Mgt 107: Fundamentals of Behavioral Science (3)
Mgt 120: Information Systems Development I (3)
Mgt 121: Information Systems Development II (3)
Mgt 122: Special Studies in Information Systems (3)

### *Mathematics*

ApSc 114: Engineering Analysis II (3)
Math 101: Introduction to Mathematical Logic (3)
Math 113: Graph Theory (3)
Math 121–22: Introduction to Abstract Algebra (3–3)
Math 123: Linear Algebra (3)

### *Operations Research*

OR 101: Survey of Operations Research: Deterministic Models (3)
OR 102: Survey of Operations Research: Stochastic Models (3)
OR 151: Linear Programming (3)
OR 190: Applied Systems Analysis and Engineering (3)

## Computer Science Undergraduate Courses

The faculty member whose name appears at the end of each course description is the course director. He or she is not necessarily the instructor for any given semester.

10 **Word Processing, Filing, and Spreadsheet Systems** (3)
Introduction to the use of a modern microcomputer system. Word-processing systems, such as AppleWriter or WordStar. Filing systems, such as DB MASTER or PFS. Spreadsheet systems, such as VISICALC or SUPERCALC. Construction of word-processing, database, and spreadsheet files of medium size and processing on microcomputers. May not be counted toward degree requirements for EE/CSci majors. (Fall and Spring) (Heller)

11 **Microcomputer DBMS, Charting, and Ledger Systems** (3)
Microcomputer database management systems such as dBASE II. Charting systems such as VISIPLOT. Ledger systems such as Peachtree General Ledger. Hands-on experience in using these systems on microcomputers. May not be counted toward degree requirements for EE/CSci majors. Prerequisite: CSci 10. (Fall and Spring) (Maurer)

30 **Computer Literacy** (3)
For students whose majors are not electrical engineering or computer science. Survey of computers and languages, communicating with a computer, introduction to BASIC, obtaining output from a computer, history of computing, positions in the computing industry, the effect of computers on our lives, uses for computers. May not be counted toward degree requirements for EE/CSci majors. Prerequisite: high school algebra. (Fall and Spring) (Martin)

51 **Introduction to Computing** (3)
Introduction to the solution of problems on a digital computer, using the Pascal language. Structured programming concepts, including top-down algorithm design and step-wise refinement of problem solution; peer review and proper documentation techniques; efficiency of programs; design of test data. Numerical and nonnumerical problems, including theory and solution of matrix problems. Writing, debugging, and running programs in an interactive computing environment. Graduate students seeking a first course in computing should enroll in CSci 100. Prerequisite or concurrent registration: Math 31 or permission of instructor. (Fall and Spring) (Martin)

53 **Computers and Society** (2)
History and impact of computers. Use of computers in the professions. Professional ethics for programmers and engineers. Applications of computers in the analysis and synthesis of physical, social, cultural, economic, and environmental processes and systems. Nature, use, and effects of a computer simulation. Application of software engineering concepts to problem solving. Prerequisite: CSci 51 or permission of instructor. (Fall and Spring) (Martin)

54 **Programming Laboratory** (1)
Advanced programming techniques, including efficiency and complexity of programs, dynamic data structures, and recursion. Design and implementation of a large programming project, using the programmer team model. Prerequisite: CSci 51 or permission of instructor. (Fall and Spring) (Martin)

56 **FORTRAN Programming** (1)
Introduction to the FORTRAN language, using concepts of program structure, modularity, and data structures. Advanced programming techniques, including efficiency and complexity of programs and use of COMMON. Design and implementation of a large programming project, using the programmer team model. Prerequisite: CSci 51 or permission of instructor. (Fall and Spring) (Martin)

100 **Introduction to Programming** (3)
More intensive introductory course for students with a science, mathematics, or other quantitative background. Solution of problems on a digital computer using FORTRAN. Data-processing concepts, numerical and nonnumerical methods using batch or interactive time-shared terminal computer systems.

Writing, debugging, and running programs on various digital computer systems. Recommended for graduate and advanced undergraduate students in other departments. Prerequisite: Math 32 or equivalent. (Fall and Spring—evening) (Martin)

121 **Software Laboratory I** (1)
Computer-programming projects designed to supplement the theory and programs of CSci 158 and 173. Students write structured programs and use proper documentation. Prerequisite or concurrent registration: CSci 158, 173. (Fall) (Rotenstreich)

122 **Software Laboratory II** (1)
Computer-programming projects designed to supplement the theory and programs of CSci 156. Team projects to design new I/O drives and similar projects involving operating system modules. Structured programming and proper documentation techniques. Prerequisite or concurrent registration: CSci 156, 158. (Spring) (Rotenstreich)

132 **Theoretical Foundations of Computing** (3)
Ordering, formal grammars, finite-state machines, equivalence of machines, reduction, finite-state languages, acceptors, regular expressions, pushdown automata, context-free languages, Turing machines, computability. Prerequisite: CSci 161; concurrent registration: CSci 158. (Spring) (Feldman)

147 **Assembly Language Programming I** (3)
Programming of microcomputers in machine and assembly language. Number systems and codes. Architectures of various microcomputers. Methods of addressing and machine control. Data representation in a microcomputer input–output control. Timing and bench-marking techniques. May be taken for graduate credit except by majors in computer science. Prerequisite: CSci 51 or equivalent. (Fall and Spring) (Rotenstreich)

150 **Introduction to Microcomputers** (3)
Introduction to the structure of microprocessors and microcomputers. Representation of information in the computer. Logic and storage devices. Processor structure, registers, transfer of information, and control. Programming in microcomputers. I/O structure and auxiliary electronics. Interrupt structures, direct memory access. LSI and its implication for microcomputers. Arithmetic operations. Different microcomputer architectures. Prerequisite: CSci 147, 153, or permission of course director. (Fall and Spring—day and evening) (Alexandridis)

151 **System Software and Software Engineering** (3)
Concepts and use of macroassemblers, loading and relocation of modules, library management, linkers and loaders. Control of I/O via access methods. Concepts in software engineering such as requirements definition, modularity, structured design, data specifications, functional specifications, verification, documentation, software maintenance. Program design using program design languages, HIPO charts. Software tools. Software project organization, design teams, quality assurance approaches. Prerequisite: CSci 147, 156, 158, 159. (Fall—day and evening) (Rotenstreich)

153 **Design of Switching Systems** (3)
Introduction to switching logic and combinational circuits. Analysis of switching devices. Minimization techniques. Number systems and codes, encoders and decoders, logic and electronic design of functional digital units. Use of LSI in logic design. Introduction to sequential circuits. Minimization of sequential machines. Design of synchronous, asynchronous, and pulse sequential circuits. State assignment and covers. May be taken for graduate credit except by majors in computer science. (Fall and Spring—day and evening) (Friedman)

154 **Digital Computer Design** (3)
Logic and electronic design of functional digital units. Design of digital computer subsystems, flow of information and logical flow diagrams in timing and control signals; binary and decimal, serial and parallel digital

arithmetic units; memory subsystems, channels, I/O, and storage subsystems; the control unit of a digital computer. Introduction to microprogramming. Design of a small digital computer. May be taken for graduate credit, except by majors in computer science. Prerequisite: CSci 147 or 157, 150, 153. (Fall and Spring—day and evening) (Meltzer)

155 **Introduction to Numerical Methods for Computers** (3)
Use of numerical methods in engineering and scientific problems. Concepts of algorithm and flowchart, errors in computer and numerical methods. Introduction to numerical methods for the solution of simultaneous linear algebraic equations, roots of equations, determination of eigenvalues and eigenvectors, numerical differentiation and integration, interpolation and solution of ordinary and partial differential equations. Statistical methods for the evaluation of experimental data and correlation techniques, curve fitting. May be taken for graduate credit except by majors in computer science. Prerequisite: ApSc 113, 115; CSci 51 or equivalent; a course in high-level computing. (Fall—day and evening) (Meltzer)

156 **Introduction to Operating Systems** (3)
Introduction to operating systems, evaluation of operating systems services. Process management, process state, concurrent processing, synchronization, events. Operating system structure, the kernel approach, processor scheduling, task switching, monitors. System management, memory management, process loading, resource allocation, queue management, communication with peripherals. File systems. Interactive computation. Protection systems. Performance evaluation. Prerequisite: CSci 147 or 157, 158, 159. (Spring—day and evening) (Rotenstreich)

157 **Assembly Language Programming II** (3)
Data types and numbering conventions. Organization of computers. Addressing modes. The instruction set and its use. Assembler operators and pseudo-operators. Interfacing to the operating system, I/O, and high-level languages. Macro and conditional pseudo-operations. Programming is carried out on a 16-bit machine, such as a member of the 8088 or 68000 family or a 65C02. May be taken for graduate credit except by majors in computer science. Prerequisite: CSci 147 or equivalent. (Fall and Spring) (Maurer)

158 **Algorithmic Methods** (3)
Structure and application of high-level programming languages. Structural programming techniques. Development of nonnumeric algorithms. Use of recursion, data types, parsing, grammars, compiling, and BNF. Semantics of computer languages. Concepts in binding times, sequence and data control, run-time resources, and object language code. Introduction to translator and storage management. Comparison of computer languages. Team programming techniques and proper documentation of programs. May be taken for graduate credit except by majors in computer science. Prerequisite: CSci 147 or 157, 159, 161. (Fall and Spring) (Heller)

159 **Programming and Data Structures** (3)
Data structures used in computer programming and algorithms. Use of tree structures, arrays, lists, stacks, files, strings, and linked structures. Sorting, searching, hashing, and merging of data. Performance of algorithms using different data structures. May be taken for graduate credit except by majors in computer science. Prerequisite or concurrent registration: CSci 161. (Fall and Spring—day and evening) (Feldman)

161 **Discrete Structures for Computing** (3)
Introduction to discrete mathematical structures that form the basis for computing. Sets, functions, and sequences. Propositional calculus, formal proofs, quantifiers, predicate calculus, mathematical induction. Matrices, semigroups, groups, homomorphism and isomorphism. Relations, partitions, equivalence relations, trees, directed and undirected graphs. May be taken for graduate credit except by majors in computer science. Prerequisite: CSci 51, Math 32. (Fall and Spring—day and evening) (Maurer)

163 **Senior Computer Science Project Laboratory I** (2)
Conception and design of a one-year project in hardware and/or software to be completed in CSci 164. Performance of a market survey and economic analysis of the product. Completion of the preliminary design. Prerequisite: EE 122; CSci 150, 158, 159; and senior status. (Fall—day and evening) (Della Torre)

164 **Senior Computer Science Project Laboratory II** (2)
Completion and construction of the project started in CSci 163. Oral and written presentation of the product designed. Prerequisite: CSci 163 (Spring—day and evening) (Della Torre)

166 **Computer Science Laboratory I** (1)
Experiments in support of the theory and design of microprocessor and microcomputer hardware and software. Use of microprocessors in control of systems. Use of simulators, cross-compilers, and development systems. Prerequisite or concurrent registration: EE 12 or 122; CSci 67 or 132, 147, 150, 153. (Fall—day and evening) (Meltzer)

167 **Computer Science Laboratory II** (1)
Experiments in support of the design of digital computing systems. Design of memory, control, and arithmetic units. Input and output in a computer. Software experiments to support the operating system for a small computer. Prerequisite or concurrent registration: CSci 154, 156, 166. (Spring—day and evening) (Meltzer)

171 **Computational Methods for Simulation** (3)
Computational methods for continuous and discrete system simulation using both digital and analog computers. Effects of computer software and hardware architectures on computational precision and accuracy requirements. Random-number generation and testing. Calibration and scaling technique. Verification and validation technique. Class project: applications to games for small microcomputers. Graphics interfacing. Analysis of case studies. Prerequisite: ApSc 113, 115; CSci 155, 158, 159. (Spring—day and evening) (Bock)

173 **Theory of Computer Translators** (3)
Lexical analysis, syntax analysis, data structures and operators, regular expressions, context-free grammars, parsing techniques, top-down parsing, efficient parsing, syntax-directed translation, intermediate formats, flow of control, block structures, procedure calls, symbol tables, run-time storage, error-detection and recovery, code optimization, code generation. Prerequisite: CSci 132, 158, 159. (Fall and Spring) (Maurer)

174 **Symbolic and Logic Processing for Artificial Intelligence** (3)
Computation using lists as symbolic structures. Abstraction of process and data structures in symbolic and logic computation for artificial intelligence. Computation with lambda calculus or pure LISP in functional programming style. Computation using changes in the state of objects and processes: use of streams. The model of a LISP interpreter using EVAL or APPLY. Environments, object-centered programming, message passing. Symbolic logic and formal inference; unification and resolution. Course uses the SCHEME (dialect of LISP) and PROLOG languages. May be taken for graduate credit except by majors in computer science. Prerequisite: CSci 158, 159. (Fall and Spring) (Garcia)

177 **Programming for Management Systems** (3)
Intermediate programming course with application in business and government commercial programming. Emphasis on programming for accounting and management information systems. Use of file editing, report generation, and tapes. Course uses the COBOL language. Prerequisite: CSci 158, 159. (Fall—day and evening) (Bock)

178 **Introduction to Database Management** (3)
Design and architecture of database systems. Query formulation, data models, data structures to minimize access time, relational data structures

Construction of a database management system. Survey of existing systems. Prerequisite: CSci 158, 159. (Spring—day and evening) (Rotenstreich)

185 **Interactive Computer Graphics I** (3)
*(formerly Introduction to Computer Graphics)*
Two-dimensional interactive computer graphics. Relevant hardware; basic concepts and organization of graphics subroutine packages; programming concepts for interaction, display, and data structuring; basic clipping and scan-conversion algorithms; two-dimensional homogeneous coordinates. May be taken for graduate credit except by majors in computer science. Prerequisite: CSci 154, 158. (Spring) (Reuter)

188 **Distributed Computing Systems** (3)
Connection of microprocessors and minicomputers into a distributed computing system. Use of shared memory and distributed data bases. Synchronization problems and concurrency in distributed systems. Shared bus structure, both loop and token passing. Geographically distributed systems and computer networks. Local area networks and point-to-point interconnections. Examples of systems. Prerequisites: CSci 151, 154, 156, 159. (Spring) (Meltzer)

197 **Special Topics in Computer Science** (1 to 3)
Topic to be announced in the *Schedule of Classes*. (Fall and Spring)

198 **Research** (1 to 3)
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and Spring)

## Graduate Study

The Department of Electrical Engineering and Computer Science provides the student who possesses a degree of basic knowledge a stimulating opportunity for advanced study. The department offers programs leading to the Master of Science, professional, and Doctor of Science degrees. The student may concentrate in the following areas: systems science, networks, and controls; electrophysics (electronics, fields, and waves); communications; medical engineering; computer science (artificial intelligence); computer science (hardware and systems); computer science (software and systems); energy conversion, power, and transmission; and telecommunications and computers.

The graduate programs are designed to provide an educational service to the Washington technical community. Many courses have been developed after consultation with private industry and government agencies in the area. A substantial number are offered during both the afternoon and the evening and alternate from year to year.

The department has continuously kept the graduate program up to date through research generated within the department and the addition of experts in appropriate fields who serve as part-time and adjunct faculty.

The department periodically publishes a detailed brochure to supplement this *Bulletin*, with information about the procedures, requirements, regulations, and scope of its graduate programs. Pamphlets describing specific programs are also available.

***Colloquium Requirement.*** Graduate students are required to attend several department colloquia each semester. These are intended to broaden the student's professional outlook and to encourage interaction with the faculty. Schedules are posted.

## Areas of Concentration

A doctoral student must select a minimum of three courses designated with an asterisk as part of his or her program in the major area.

### Communications

EE 204: Stochastic Signals and Noise
EE 205: Stochastic Processes in Electrical Engineering
EE 208: Digital Image Processing
EE 241: Information Theory
EE 242: Coding Theory
EE 243: Communication Theory I
EE 244: Communication Theory II
EE 245: Signal Detection and Estimation Theory
EE 246: Digital Communications
*EE 247: Communications Systems
EE 248: Computer Communication Networks I
EE 249: Computer Communication Networks II
*EE 250: Telecommunications Security Systems
*EE 251: Switched Telecommunication Networks
EE 252: Digital Signal Processing Techniques
EE 254: Radar Systems
*EE 257: Secure Communications
*EE 258: Radio Communications Systems I
*EE 259: Radio Communications Systems II
*EE 277: Satellite Communications Systems
EE 298: Research
EE 299–300: Thesis Research
*EE 345: Advanced Detection Theory
*EE 346: Telecommunications Protocols
*EE 347: Telecommunications Software Engineering
EE 349: Communications Research
EE 399: Dissertation Research

### Computer Science (Core Courses)

Required of computer science majors in artificial intelligence, hardware and systems, and software and systems.

CSci 217: Computing Algorithms
CSci 232: Automata and Formal Languages
CSci 237: Computing Systems I
CSci 258: Advanced Programming Languages

### Computer Science (Artificial Intelligence)

CSci 212: Discrete Analysis in Computer Science
CSci 215: Advanced Data Structures
*CSci 220: Pattern Recognition
CSci 221: Machine Learning
*CSci 224: Artificial Intelligence
*CSci 226: Robotics
CSci 298: Research
CSci 299–300: Thesis Research
*CSci 321: Advanced Machine Learning
*CSci 322: Natural Language Understanding
*CSci 324: Knowledge-Based Systems
CSci 391: Computer Science Research
CSci 399: Dissertation Research
EE 204: Stochastic Signals and Noise

## Computer Science (Hardware and Systems)

CSci 203: Microprocessors and Microcomputers
CSci 212: Discrete Analysis in Computer Science
CSci 231: Sequential Machines
CSci 238: Computing Systems II
*CSci 239: Comparative Computer System
*CSci 240: Theory and Practice of Microprogramming
*CSci 243: Fault-Tolerant Systems and Design Automation
CSci 244: Data Communications
*CSci 245: Advanced Computer Systems Theory I
*CSci 246: Advanced Computer Systems Theory II
CSci 298: Research
CSci 299–300: Thesis Research
*CSci 337: VLSI System Organization and Applications
CSci 391: Computer Science Research
CSci 399: Dissertation Research
EE 126: Introduction to VLSI Design and Simulation
EE 127: VLSI Fabrication Techniques
EE 128: Testing and Simulation of VLSI Systems
EE 214: VLSI Design
EE 230: Physical Design of Memory Devices

## Computer Science (Software and Systems)

CSci 215: Advanced Data Structures
CSci 216: Information Retrieval Systems
CSci 219: Interactive Computer Graphics II
CSci 222: Design of User–Computer Dialogues
CSci 227: Management Information Systems and Database Management
CSci 229: Computer Security Systems
CSci 247: Languages for Systems Programming
CSci 255: Analysis and Correctness of Algorithms
*CSci 256: Design of Translators
*CSci 267: Operating Systems I
*CSci 268: Operating Systems II
*CSci 270: Software Engineering
CSci 281: Numerical Solutions of Algebraic Systems
CSci 282: Numerical Solution of Ordinary Differential Equations
CSci 298: Research
CSci 299–300: Thesis Research
*CSci 319: Interactive Computer Graphics III
*CSci 327: Advanced Topics in Information Systems
*CSci 356: Seminar in Programming Language Design and Implementation
*CSci 358: Concurrency and Parallelism in Programming Languages
CSci 391: Computer Science Research
CSci 399: Dissertation Research

## Electrophysics (Electronics, Fields, and Waves)

EE 201: Natural Modes and Transients in Electrical Systems
EE 206: Electromagnetic Theory and Applications I
EE 207: Electromagnetic Theory and Applications II
EE 221: Physical Electronics I
EE 222: Physical Electronics II
EE 223: Optical Communications Systems
*EE 224: Electronics of Lasers

EE 225: Nonlinear Electronics
*EE 226: Fiber and Integrated Optics
EE 227: Industrial Electronics
EE 228: High-Frequency Electronics
*EE 232: Electrodynamics
EE 233: Microwaves and Components
*EE 234: Electromagnetic Wave Propagation
EE 235: Antennas
*EE 236: Plasma Dynamics
*EE 237: Waves in Random Media
EE 238: Remote Sensing
EE 239: Numerical Laboratory in Electromagnetics
EE 255: Optical Processing
EE 298: Research
EE 299–300: Thesis Research
*EE 321: Approximate Mathematical Techniques for Electromagnetics
*EE 322: Advanced Waveguide Diffraction and Design
*EE 323: Principles of Microelectronics
*EE 329: Electrophysics Research
*EE 335: High-Resolution Antenna Array Processing Techniques
EE 399: Dissertation Research

### Energy Conversion, Power, and Transmission

EE 178: Electrical Power Systems
EE 202: Linear Systems Theory I
EE 206: Electromagnetic Theory and Applications I
*EE 261: Electromechanical Energy Conversion
*EE 262: Power Electronics
EE 263: Design of Reliable Emergency and Standby Power Systems
*EE 264: Direct Electrical Energy Conversion
EE 265: Transients in Electrical Power Transmission Lines
EE 266: Electrical Power Transmission I
EE 267: Electrical Power Transmission II
EE 268: Electrical Power Distribution
EE 269: Issues in Electrical Power Generation and Transmission
EE 298: Research
EE 364: Applications of Direct Energy Conversion
EE 368: High-Voltage Testing Techniques for Electrical Apparatus
EE 399: Dissertation Research

### Medical Engineering

EE 280: Introduction to Medicine for Engineers I: Physiology and Anatomy
EE 281: Introduction to Medicine for Engineers II: Physiology and Anatomy
EE 282: Medical Measurements I
EE 283: Medical Measurements II
EE 285: Evoked Potentials I
EE 287: Rehabilitation Engineering
*EE 289: Clinical Engineering
EE 298: Research
EE 299–300: Thesis Research
*EE 381: Computer-Aided Analysis of Physiological Signals
*EE 382: Physiological Controls and Systems
*EE 384: Medical Imaging
*EE 385: Evoked Potentials II
*EE 386: Bioelectromagnetics
EE 389: Medical Engineering Research
EE 399: Dissertation Research

## Systems Science, Networks, and Controls

*CSci 220: Pattern Recognition
EE 202: Linear Systems Theory
EE 203: Graph Theory and Applications
EE 204: Stochastic Signals and Noise
EE 212: Network Analysis
*EE 213: Computer-Aided Analysis and Design of Systems
EE 214: VLSI Design
EE 215: Linear Network Synthesis I
*EE 216: Synthesis of Active and Distributed Networks
*EE 218: Analog MOS VLSI Circuits for Signal Processing
EE 219: Digital Filter: Design and Realization
EE 252: Digital Signal Processing Techniques
EE 262: Power Electronics
*EE 271: Linear Multivariable Control Theory
EE 272: Computer Control Systems
EE 273: Systems Optimization
*EE 274: Nonlinear Systems
*EE 275: System Identification and Adaptive Control Systems
*EE 279: Stochastic Control Systems
EE 298: Research
EE 299–300: Thesis Research
EE 319: Systems Science, Networks, and Control Research
*EE 372: Analysis and Control of Large Systems
EE 399: Dissertation Research

## Telecommunications and Computers

CSci 159: Programming and Data Structures
CSci 201: Introduction to Computer Systems
CSci 216: Information Retrieval Systems
CSci 217: Computing Algorithms
CSci 227: Management Information Systems and Database Management
CSci 229: Computer Security Systems
CSci 247: Languages for Systems Programming
CSci 267: Operating Systems I
CSci 268: Operating Systems II
EAd 261: Economic Analysis in Engineering Planning
EAd 262: Finance for Engineers
EAd 281: Systems Analysis and Management I
EE 144: Elements of Communications Engineering Design II
EE 204: Stochastic Signals and Noise
EE 205: Stochastic Processes in Electrical Engineering
EE 242: Coding Theory
EE 243: Communication Theory I
EE 244: Communication Theory II
EE 246: Digital Communications
EE 248: Computer Communication Networks I
EE 249: Computer Communication Networks II
EE 250: Telecommunications Security Systems
EE 251: Switched Telecommunication Networks
EE 257: Secure Communications
EE 258: Radio Communications Systems I
EE 259: Radio Communications Systems II
EE 346: Telecommunications Protocols
EE 347: Telecommunications Software Engineering

## Master of Science Degree Program

The Department of Electrical Engineering and Computer Science offers graduate study leading to the degree of Master of Science in the following areas of concentration. There are no required courses or programs of study, except for the core courses required in the computer science concentrations. Each student formulates an individualized program in consultation with an assigned faculty adviser. Faculty members who may serve as advisers are listed after each area.

***Communications***—Helgert, Heller, Kakaes, Lang, Newman, Pickholtz, Saha, Wasylkiwskyj

***Computer Science (Artificial Intelligence)***—Bock, Carroll, Della Torre, Foley, Garcia, Loew, Meltzer, Rotenstreich, Senay, Sibert, Zaghloul

***Computer Science (Hardware and Systems)***—Alexandridis, Berkovich, Della Torre, Foley, Friedman, Garcia, Meltzer, Narahari, Senay, Youssef, Zaghloul

***Computer Science (Software and Systems)***—Berkovich, Bock, Della Torre, Feldman, Foley, Heller, Hoffman, Martin, Maurer, Reuter, Rotenstreich, Senay, Sibert

***Electrophysics (Electronics, Fields, and Waves)***—Heller, Kahn, Lang, Wasylkiwskyj

***Energy Conversion, Power, and Transmission***—Harrington, Kahn, Lang

***Medical Engineering***—Eisenberg, Loew

***Systems Science, Networks, and Controls***—Carroll, Kyriakopoulos, Lee, Loew, Zaghloul

***Telecommunications and Computers***—Alexandridis, Helgert, Hoffman, Kakaes, Meltzer, Pickholtz, Saha; Shane, Steiner (Engineering Administration)

### Admission

Admission to study toward a master's degree requires an appropriate bachelor's degree (one in engineering technology is normally not sufficient) from a recognized institution and evidence of capacity for productive work in the field selected, as indicated by grades, scores on the Graduate Record Examination general test, and similar data. Students are encouraged to submit GRE scores; those who do will be given preference in consideration for research and teaching fellowships. The regulations regarding transfer of credit also apply to courses taken as a nondegree student through the Division of Continuing Education at George Washington University.

#### *General Requirements*

The applicant must be recommended for admission by the chair of the Department of Electrical Engineering and Computer Science; must have a quality-point index of at least 2.90 (on a scale of 4.00), or equivalent, for the last 60 semester hours of undergraduate work; and must be adequately prepared in the basic sciences (physics and either chemistry or biology) and in mathematics (four semesters beyond precalculus).

### Specific Requirements

The applicant must also have satisfied, through undergraduate studies, the following specific requirements according to the area of concentration.

***Communications***

1. Networks with applications using Laplace transforms (6 semester hours—EE 11 and 12, or equivalent)
2. Electronics (3 semester hours—EE 20 or equivalent)
3. Communication theory (3 semester hours—EE 143 or equivalent)

***Computer Science***

1. Computer programming using assembly language, Pascal, and programming theory (9 semester hours—CSci 51, 147, and 158; or equivalent)
2. Computer hardware (6 semester hours—CSci 153 and 154, or equivalent)
3. Discrete mathematics and data structures (6 semester hours—CSci 159 and 161, or equivalent)

***Electrophysics***

1. Networks with applications using Laplace transforms (6 semester hours—EE 11 and 12, or equivalent)
2. Electronics including analysis, design, and physical theory (6 semester hours—EE 20 and 121, or equivalent)
3. Fields and waves (6 semester hours—EE 31 and 32, or equivalent)

***Energy Conversion, Power, and Transmission***

1. Network analysis using Laplace transforms (6 semester hours—EE 11 and 12, or equivalent)
2. Fields and waves (6 semester hours—EE 31 and 32, or equivalent)
3. Electrical energy conversion (3 semester hours—EE 177 or equivalent)

***Medical Engineering***

Either:

1. Network theory (3 semester hours—EE 11 or equivalent)
2. Electronic circuits (6 semester hours—EE 20 and 121, or equivalent)

Or:

1. Computer programming (3 semester hours—CSci 100 or equivalent)
2. Computer hardware and software (6 semester hours—CSci 153 and 147, or equivalent)

***Systems Science, Networks, and Controls***

1. Networks with applications using Laplace transforms (9 semester hours—EE 11, 12, 113; or equivalent)
2. Electronics (3 semester hours—EE 20 or equivalent)
3. Control theory (3 semester hours—EE 172 or equivalent)

***Telecommunications and Computers***

1. Communication theory (3 semester hours—EE 143 or equivalent)
2. Computer science (6 semester hours—CSci 100, either 150 or 147; or equivalent)

Students with some undergraduate deficiencies may be required to complete 6 semester hours of undergraduate work. Normally this work must be completed prior to enrolling in graduate courses. If such deficiencies represent more than 6 semester hours, the applicant may be admitted as an unclassified

student to complete a specified undergraduate program before being admitted as a degree candidate.

## Program of Study

Upon admission to the Master of Science program, the student is assigned a faculty adviser. The student and faculty adviser formulate a program of study, complete the Graduate Program of Studies (Form 1), and submit it to the department chair for approval. This form should be completed prior to or at the student's first registration. During consultation the student should determine whether to request permission to pursue the nonthesis option.

The program of study for the Master of Science degree consists of a minimum of 24 semester hours of graduate-level courses and 6 semester hours of thesis or, for the nonthesis option, a minimum of 33 semester hours of graduate-level courses. In both cases a student must select a minimum of three graduate courses outside his or her major area of concentration unless the student already has a graduate degree in another field.

For the thesis option, a minimum of 12 semester hours must be in the major field of concentration. For the nonthesis option, a minimum of 21 semester hours must be in the major field. In the case of an interdisciplinary program, no courses outside the major are required, but courses must be divided approximately equally between or among the disciplines chosen.

A maximum of three courses at the 100 level may be counted toward the requirements for the degree; the course description must specify that the course may be taken for graduate credit.

## Master's Comprehensive Examination

After completing the prescribed program in either the thesis or the nonthesis option, the student must pass the Master's Comprehensive Examination. The examination is scheduled twice a year. On the prescribed form and prior to the deadline, students must notify the department of their intent to take the examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused absence constitutes a forfeiture and is regarded as a failure of the examination. The examination lasts an entire day. The student is asked to solve several problems relating to the subject matter of his or her major area of study and must demonstrate the ability to apply what has been learned. The examination is not limited to specific courses that the student has taken but is designed to demonstrate the student's ability to integrate material from several course areas and to learn from the readings.

A student who fails the Master's Comprehensive Examination on the first attempt may, in exceptional circumstances, be reexamined once more if approval is given by the appropriate examining committee and the department. If the student fails the examination on the second attempt, the student's graduate status is terminated.

# Professional Degree Program

Students may study for the professional degree in the following concentrations: communications; computer science (artificial intelligence, hardware and systems, software and systems); electrophysics (electronics, fields, and waves); medical engineering; systems science, networks, and controls; and energy

conversion, power, and transmission. There are no required courses or programs of study, except for the core courses required in the computer science concentrations. Each student formulates an individualized program in consultation with an assigned faculty adviser.

## Admission

In addition to satisfying SEAS requirements for admission to study toward a professional degree, applicants to professional degree programs in the Department of Electrical Engineering and Computer Science must meet the following requirements.

### General Requirements

The applicant must be recommended for admission by the chair of the Department of Electrical Engineering and Computer Science; must have a quality-point index of at least 3.0 (on a scale of 4.0) and two years of professional experience after obtaining the master's degree; and must be adequately prepared in the basic sciences (physics and either chemistry or biology) and in mathematics (calculus through differential equations).

### Specific Requirements

The applicant must also have satisfied, through previous studies, the following specific requirements according to the area of concentration.

***Communications***—Nine semester hours of statistical theory of communications and 3 semester hours of information theory (EE 204, 241, 243, 244; or equivalent)

***Computer Science (Artificial Intelligence)***—Fifteen semester hours of computer science and numerical methods at the graduate level (CSci 215, 217, 221, 224, 232; or equivalent)

***Computer Science (Hardware and Systems)***—Twelve semester hours of computer design and theory at the graduate level (CSci 215, 217, 232, 237; or equivalent)

***Computer Science (Software and Systems)***—Twelve semester hours of computer programming and theory at the graduate level (CSci 215, 217, 232, 258; or equivalent)

***Electrophysics***—Twelve semester hours of physical electronics and electromagnetics at the graduate level (EE 201, 206, 207, 221; or equivalent)

***Energy Conversion, Power, and Transmission***—Twelve semester hours of electrical machine theory and networks at the graduate level (EE 261, 262, 264, 266; or equivalent)

***Medical Engineering***—Twelve semester hours of medical engineering at the graduate level (EE 280, 281, 282, 283; or equivalent)

***Systems Science, Networks, and Controls***—Fifteen semester hours of network systems analysis at the graduate level, including a knowledge of state-space and linear graph theory (EE 202, 204, 212, 272, 273; or equivalent)

An applicant who does not meet the specific requirements, but meets all other admission requirements, may be admitted with a program of study that includes additional course work to cover the needed background material.

## Program of Study

Upon admission to the professional degree program, the student is assigned a faculty adviser. Together they formulate a program of study for the student, which must contain a minimum of 30 semester hours of courses, and then complete the Graduate Program of Studies form. Programs of study and any subsequent changes must be approved by both the faculty adviser and the department chair.

The program of study for the professional degree in the Department of Electrical Engineering and Computer Science will normally consist of a minimum of 18 semester hours of graduate-level courses in the major area of concentration and a minimum of 9 additional semester hours of graduate-level courses outside the major. A student who is changing his or her major area from that studied for the master's degree or who lacks specific admission requirements may have to take additional courses to make up deficiencies. Such additional work normally should not exceed 12 semester hours.

## Doctor of Science Degree Program

The Department of Electrical Engineering and Computer Science offers programs of study leading to the Doctor of Science degree in the areas of concentration listed under Specific Requirements, below. There are no required courses or programs of study, except for the core courses required in the computer science areas of concentration. Upon admission, each student formulates an individualized program in consultation with the assigned faculty adviser. Special fields of each faculty member are listed below.

***N.A. Alexandridis***—microprocessors, super computing systems architectures, multiprocessor systems, adaptable computer architectures, image processing

***S. Berkovich***—information systems, data structures, associative memories and processors, computer organization, mathematical modeling

***P. Bock***—computer science, artificial intelligence, robotics, simulation, programming languages, microprocessor systems

***R.L. Carroll***—control theory, adaptive systems

***E. Della Torre***—numerical device modeling, magnetic recording and bubble memory and VLSI components, magnetic phenomena

***M. F. Eisenberg***—medical engineering, thermography, evoked response, ultrasonics

***M.B. Feldman***—computer science, programming languages, data structures, automata theory, software engineering

***J.D. Foley***—interactive computer graphics, human factors of the man–machine interface, distributed processing and networking

***A.D. Friedman***—computer architecture and organization, switching theory and logic design, microprocessors, diagnosis and fault-tolerant design of digital circuits, digital system design automation

***O.N. Garcia***—computer architecture, artificial intelligence, symbolic and logic processors, testing and reliability of digital systems

***R.J. Harrington***—simulation and control of electrical machinery and power systems, transient stability, transmission line switching transients, computer modeling

***H.J. Helgert***—communications and information theory, coding theory, data communications, computer networks

***R.B. Heller***—information processing, computer-to-computer communications networks, satellite communications, electromagnetic radiation
***R.S. Heller***—computer literacy, computers in education, programming languages
***L.J. Hoffman***—computer science, security and privacy, criminal justice information systems, social implications
***W.K. Kahn***—antennas, microwave components, fiber optics, electrophysics
***A.K. Kakaes***—communications theory, computer communication networks, packet radio networks
***N. Kyriakopoulos***—computer-aided network design, systems theory, control theory, digital filtering
***R.H. Lang***—wave propagation in random media, remote sensing, phase-locked loops, adaptive arrays
***T.N. Lee***—networks, linear systems
***M.H. Loew***—pattern recognition, medical engineering, image processing
***C.D. Martin***—computer literacy, computers in education, computers and society, LOGO
***W.D. Maurer***—computer science, correctness of programs, analysis of algorithms, semantics of programming languages
***A.C. Meltzer***—computer architecture, design of computer systems, database systems, multi-processor systems, hybrid computation
***B. Narahari***—parallel processing, algorithms and interconnection networks, reconfigurable parallel computer architectures, special purpose computing
***D.B. Newman, Jr.***—data communications, computer communication networks, detection and estimation theory
***R.L. Pickholtz***—data communications, computer communication networks, communications theory, secure communications
***L.H. Reuter***—computer graphics, fractal modeling
***D.C. Rohlfs***—specialized measurements and instrumentation, electronic devices, high-power HF systems
***S. Rotenstreich***—software engineering, operating systems
***D. Saha***—communication theory, modulation and coding techniques
***H. Senay***—artificial intelligence, human–computer interaction, logic programming, computer architecture
***J.L. Sibert***—computer graphics, human–computer interaction
***W. Wasylkiwskyj***—electromagnetic waves, propagation, signal processing, remote sensing
***A. Youssef***—interconnection networks, parallel computer architecture, parallel algorithms, algorithms and data structures, theory of computing
***M. Zaghloul***—computer-aided analysis and design, VLSI modeling, design, and testing

## Admission

In addition to satisfying SEAS requirements for admission to study toward the Doctor of Science degree, applicants to doctoral programs in the Department of Electrical Engineering and Computer Science must meet the following requirements.

### *General Requirements*

The applicant must be recommended for admission by the chair of the Department of Electrical Engineering and Computer Science; must have a

minimum quality-point index of 3.40 (on a scale of 4.00), or equivalent, in graduate course work leading to the master's degree; and must be adequately prepared in the basic sciences (physics and either chemistry or biology) and in mathematics (calculus through differential equations).

### *Language Requirement*

Although knowledge of a foreign language is often advantageous in pursuing graduate study, there is no formal foreign language requirement for the Doctor of Science program in the Department of Electrical Engineering and Computer Science.

### *Specific Requirements*

The applicant must also have satisfied, through previous studies, the following specific requirements according to the area of concentration (major area).

***Communications***—Nine semester hours of statistical theory of communications and 3 semester hours of information theory (EE 204, 241, 243, 244; or equivalent)

***Computer Science (Artificial Intelligence)***—Fifteen semester hours of computer science and numerical methods at the graduate level (CSci 215, 217, 221, 224, 232; or equivalent)

***Computer Science (Hardware and Systems)***—Twelve semester hours of computer design and theory at the graduate level (CSci 215, 217, 232, 237; or equivalent)

***Computer Science (Software and Systems)***—Twelve semester hours of computer programming and theory at the graduate level (CSci 215, 217, 232, 258; or equivalent)

***Electrophysics***—Twelve semester hours of electronics and electromagnetic fields and waves at the graduate level (EE 201, 206, 207, 221; or equivalent)

***Energy Conversion, Power, and Transmission***—Twelve semester hours of electrical-machines theory and networks at the graduate level (EE 261, 262, 264, 266)

***Medical Engineering***—Twelve semester hours of medical engineering at the graduate level (EE 280, 281, 282, 283; or equivalent)

***Systems Science, Networks, and Controls***—Twelve semester hours in network systems analysis at the graduate level, including a knowledge of state-space and linear graph theory (EE 202, 204, 212, 272, 273; or equivalent)

An applicant who does not meet the specific requirements, but meets all other admission requirements, may be admitted with a program of study that includes additional course work to cover the needed background material.

## Program of Study

At the time of admission, the student pursuing a Doctor of Science degree in the Department of Electrical Engineering and Computer Science is assigned a faculty adviser in the major area of study. In consultation with the adviser during the first semester, the student determines the two minor areas of study. Together they formulate a program of study for the student that will lead to the qualifying examination, and they complete the Graduate Program of Studies form (Form 1). Programs of study and any subsequent changes must be approved by both the faculty adviser and department chair.

### Major Area

The program of studies for the Doctor of Science degree will normally consist of one major area of concentration and two minor areas, including a minimum of 30 semester hours of graduate-level courses (200 and above) beyond the master's level. A minimum of 15 semester hours must be taken in the major area, including a minimum of three courses designated with an asterisk in the list of areas of concentration. A student who is changing his or her major area from that studied for the master's degree or who lacks specific admission requirements may have to take additional courses to make up deficiencies. Such additional work normally should not exceed 12 semester hours.

### Minor Areas

Minor areas are not confined to the Department of Electrical Engineering and Computer Science but may be taken from other departments within the University, such as mathematics, statistics, operations research, and physics. Normally a minimum of three graduate-level courses constitutes a minor area. For those students whose major area of study is not computer science and who take their minor area studies within the Department of Electrical Engineering and Computer Science, the following courses represent adequate programs in each minor area.

***Communications***—EE 204, 205 or 241, 243, and 244 or 249
***Computer Science (Artificial Intelligence)***—CSci 159, 174, 221, 224
***Computer Science (Hardware and Systems)***—CSci 153, 154, 237, 238
***Computer Science (Software and Systems)***—CSci 159, 201, 217, 258
***Electrophysics***—EE 201, 206, 207, 221
***Energy Conversion, Power, and Transmission***—EE 261, 262, 264, 266
***Medical Engineering***—EE 280, 281, 282, 283
***Systems Science, Networks, and Controls***—EE 202, 212, 272, 273

### Qualifying Examination

The qualifying examination for doctoral students in the department is composed of two parts. The first part is the department's Master's Comprehensive Examination in the major area, on which the student must demonstrate superior performance in order to qualify as a doctoral student. This requirement is waived for those who received the M.S. degree from the department and, within two years prior to entering the doctoral program, demonstrated superior performance on the comprehensive examination. All other incoming students must take the comprehensive within three semesters of the date of admission to the doctoral program or, for those entering as unclassified students because of stated course deficiencies, within five semesters of first registration as an unclassified student. A student who fails to demonstrate superior performance must take the examination again in one of the two following semesters. A student may take the comprehensive only twice. Failure to show superior performance on the second try will result in termination of the student's candidacy.

The student takes the second part of the qualifying examination upon completion of the formal program of study. The purpose of this part is to ascertain that the student's background and intellectual development are adequate to support doctoral research in the major area. It normally consists of two sections, each of one day's duration. One section, a written and/or oral examination covering the major area of study, is given only in the spring

semester. The other, a written and/or oral examination covering one minor area, is given in the fall and spring. Additional oral examinations may be required. The student must pass both sections of this examination within, at most, two semesters of the semester in which any section is first attempted. A candidate who fails either section of the examination on the first attempt may take that section once more, if the examining committee approves and the time limit is not exceeded. Failure to pass the qualifying examination will terminate the student's doctoral candidacy.

The questions on the qualifying examination are not limited to the areas in which the student has taken course work but are designed to demonstrate the student's ability to integrate material from several areas and from individual study. The student should be familiar with the contents of current journals and with the books on the reading lists for both the areas of examination and the courses taken.

### *Dissertation*

After passing the qualifying examination, the student makes arrangements for the assignment of a research director (not necessarily the student's faculty adviser), who selects an appropriate advisory committee. The advisory committee monitors the student's dissertation development and, in conjunction with the research director, gives guidance to the student. After the student completes the dissertation, the advisory committee becomes the examining committee, with the addition of at least one new person. The dissertation should be of such quality that all or part is suitable for publication. Doctoral students are encouraged to publish their work.

## Graduate Courses

In addition to the Electrical Engineering and Computer Science graduate courses described below, the following undergraduate courses may be taken for graduate credit if they are included in the student's approved program of study. Students considering these courses should consult with their adviser. See the undergraduate section for course descriptions and restrictions.

EE 126: Introduction to VLSI Design and Simulation
EE 127: VLSI Fabrication Techniques
EE 128: Testing and Simulation of VLSI Circuits
EE 144: Elements of Communications Engineering Design II
EE 169: Advanced Electronics Design Laboratory
EE 178: Electrical Power Systems
EE 184: Medical Engineering Instrumentation and Systems Design
CSci 147: Assembly Language Programming I
CSci 153: Design of Switching Systems
CSci 154: Digital Computer Design
CSci 155: Introduction to Numerical Methods for Computers
CSci 157: Assembly Language Programming II
CSci 158: Algorithmic Methods
CSci 159: Programming and Data Structures
CSci 161: Discrete Structures for Computing
CSci 174: Symbolic and Logic Processing for Artificial Intelligence
CSci 185: Interactive Computer Graphics I

## Electrical Engineering Graduate Courses

The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

201 **Natural Modes and Transients in Electrical Systems** (3)
Transient response and natural modes of electrical systems, techniques for analyzing systems with periodic and aperiodic inputs and outputs, Fourier and Laplace transforms. Inversion, integration in the complex plane. Sampling; discrete systems, *z*-transforms; applications. Prerequisite: graduate status. (Fall and Spring—evening) (Heller)

202 **Linear Systems Theory** (3)
Introduction to linear systems theory. Topics include linear vector spaces and linear operators, mathematical representation of dynamic linear systems, concept of state and solution of the state equation, controllability and observability, canonical forms of the state equation, state feedback, and state estimation. (Spring and Fall) (Zaghloul)

203 **Graph Theory and Applications** (3)
Introduction to oriented and nonoriented graphs. Topics may include graph theory applications to the routing problems of multiple printed circuits; circuit concepts of linear vector spaces; network analysis and synthesis, topological formulas; paths, reachability, connectedness, tree representations, transportation flows, and communications networks. Computer science applications such as storage representation and manipulation of computer data and other related techniques. (Spring, even years) (Zaghloul)

204 **Stochastic Signals and Noise** (3)
Probability, random variables, characteristic functions; transformations of random variables and applications; sequences of random variables, linear mean-squared estimation; stationary estimation, stationary random processes, correlation functions, power spectrum; output of linear systems with stochastic inputs; Gaussian processes. Applications drawn for communications, control theory, computer science. Prerequisite: ApSc 115 or equivalent. (Fall and Spring—day and evening) (Lang)

205 **Stochastic Processes in Electrical Engineering** (3)
Markov chains, state classification, Kolmogorov equation; applications to probabilistic finite-state machines. Birth–death process, applications to queuing theory, buffer problems, and the design of communications nets. Continuous state processes, diffusion processes, passage times, and estimation problems. Estimation and power spectra. Stochastic difference and differential equations. Applications to communications theory, control theory, computer science, and propagation theory of random media. Prerequisite: EE 204 or equivalent. (Spring—evening) (Lang)

206 **Electromagnetic Theory and Applications I** (3)
Brief review of vector-phasors and Maxwell's equations, electromagnetic potentials, power and energy; plane waves, frustrated total reflection, skin effect, anisotropic media; solution of radiation problems in the Kirchhoff approximation; elementary applications. Prerequisite: EE 133 or equivalent. (Fall—evening) (Lang)

207 **Electromagnetic Theory and Applications II** (3)
Introduction to advanced techniques for problems in electromagnetics; leaky waves and complex wave types, stationary phase and steepest descent approximations for integrals in the complex plane. Discrete and continuous spectra. Application to optical fibers, surface and leaky-wave antennas, ground-wave propagation. Prerequisite: EE 206. (Spring—evening) (Lang)

208 **Digital Image Processing** (3)
Properties of images and visual systems. Picture description, sampling and quantization. One- and two-dimensional image transform techniques including Fourier, cosine, and Hadamard. Methods of image enhancement and restoration. Image coding and data compression techniques. Automated image analysis and recognition. Computer applications and projects. Prerequisite: EE 204. (Spring—evening) (Loew)

212 **Network Analysis** (3)
Network theorems, functions, and properties; relationship of parts of network functions; realizability and causality concepts. Introduction to the theory of nonlinear networks, nonlinear resistive network equation formulation, hybrid and other nonlinear equations. Nonlinear dynamic network equation formulation, state space, conditions for existence. Concepts of stability in nonlinear networks, conservative and Lagrangian networks and systems. (Fall, odd years) (Zaghloul)

213 **Computer-Aided Analysis and Design of Systems** (3)
Numerical solution of algebraic set of equations, Newton–Raphson and modified Newton–Raphson techniques, solution of algebraic equations with multiple solutions. Numerical solution of nonlinear ordinary differential equations for stable and stiff systems. Numerical optimization techniques. Linear and nonlinear programming. Computer-aided sensitivity analysis of networks. Application in the design of large systems and in automated design. Prerequisite: EE 202 or 212. (Fall, odd years) (Zaghloul)

214 **VLSI Design** (3)
Advanced design and analysis techniques for VLSI circuits. Design of reliable VLSI circuits, noise consideration, worst-case design. Design and optimization of large fan-out and fan-in circuits clocking methodologies. Techniques for data-path and data-control design. Simulation techniques. Students design VLSI circuits using CAD computer and simulate design. Prerequisite: EE 126, undergraduate degree in electrical engineering, or permission of instructor. (Fall, even years) (Zaghloul)

215 **Linear Network Synthesis I** (3)
Properties and testing of positive real functions. Synthesis of LC, RL, RC one-port networks. Brune, Bott–Duffin, Miyata, Kuh, and Darlington synthesis techniques. Introduction to two-port ladder and lattice synthesis. Three-terminal RC network synthesis approximation in the frequency and time domains. Prerequisite: EE 202 or permission of course director. (Fall, even years—evening) (Lee)

216 **Synthesis of Active and Distributed Networks** (3)
Active network synthesis using negative resistors, control sources, NIC, operator, and operational amplifiers. Uniform and nonuniform distributed network analysis and synthesis—computer-aided design. Prerequisite: EE 215. (Spring, odd years) (Lee)

218 **Analog MOS VLSI Circuits for Signal Processing** (3)
MOS devices as circuit elements, MOS technology, analog MOS building blocks, MOS capacitors, limitation, low-noise design techniques, design of switched-capacitor circuits, A/D converters. Layout examples and design principles. Students use the CAD VLSI laboratory to design and simulate circuits. Prerequisite: EE 126 or equivalent. (Fall, even years) (Zaghloul)

219 **Digital Filter: Design and Realization** (3)
Properties of transfer functions. Filter approximation, sensitivity, and computation techniques. Digital signals and systems, basic block of digital filters, stability consideration. Analysis of digital filters. Design of IIR and FIR digital filters. Computation techniques. Direct and indirect realization of digital filters. Microprocessor implementation. Applications and selected papers. Prerequisite: EE 202 or permission of course director.
(Spring, odd years) (Zaghloul)

221 **Physical Electronics I** (3)
Theoretical principles underlying the operation of electronic devices; classical mechanics and classical statistical mechanics, the quantum theory, wave and matrix mechanics, quantum statistics. (Fall—evening) (Braun)

222 **Physical Electronics II** (3)
The Boltzmann transport equation, band theory of solids, time-dependent perturbation theory, group theory. Applications to semiconductor and other solid-state devices such as transistors, tunnel diodes, masers, and lasers. Prerequisite: EE 221. (Spring—evening) (Braun)

223 **Optical Communications Systems** (3)
Optical communications channels; survey of laser sources; modulation; line-of-sight links; system models and analysis; detection, photoemitters, photodiodes, and photoconductors; noise mechanisms and signal-to-noise analysis; optical-fiber waveguides, electromagnetic field description of material, waveguide, and modal dispersion; optical-fiber cabling, repeaters, and systems analysis; integrated optical components. Prerequisite: EE 207, 243. (Spring, odd years—evening) (Kahn)

224 **Electronics of Lasers** (3)
Basic concepts from quantum mechanics, Einstein coefficients, inversion and pumping mechanisms, rate equations. Resonators, He–Ne laser; organic dye lasers, injection lasers. Nonlinear interactions in lasers. Prerequisite: EE 222 or equivalent. (Fall 1987 and every third year thereafter—evening) (Kahn)

225 **Nonlinear Electronics** (3)
Analysis and design of electronic components and systems operating as switching, sweeping, gating, and pulse generators. Study of multivibrators, negative resistance devices and amplifiers, nonlinear operation of oscillators. Prerequisite: EE 201 or equivalent. (Fall, even years—evening) (Heller)

226 **Fiber and Integrated Optics** (3)
Single-mode and multimode propagation in stepped-index and gradient-index optical fibers: scattering and attenuation characteristics of fibers, phase velocity, group velocity, impulse response, energy transport, ray tracing, Goos–Haenchen shift, Hamiltonian formalism. Directional couplers, modulators, and deflectors in fibers and surface films. Coupled-mode theory. (Spring, even years—evening) (Kahn)

227 **Industrial Electronics** (3)
Applications of electronic devices in industry, continuous and sampled control systems, induction and dielectric heating, timing and counting circuits, reliability and automatic checking equipment, digital control of machine tools. Prerequisite: EE 201 or equivalent and graduate status. (Fall, odd years—evening) (Heller)

228 **High-Frequency Electronics** (3)
Design and analysis of the operation of electron-tube, solid-state, crossed-field, space-charge wave, and quantum maser oscillators and amplifying devices that lay the foundation of modern communications systems. Prerequisite: EE 207 or equivalent. (Spring, even years) (Heller)

230 **Design of Memory Devices** (3)
Physical principles of magnetic and semiconductor memory devices. Design and manufacture of Ram's and disk files. Device and system characteristics reliability. Prerequisite: EE 122. (Spring, odd years) (Della Torre)

232 **Electrodynamics** (3)
Special theory of relativity and the Lorentz transformation, Minkowski formulation. Maxwell's equations in the context of special relativity, electromagnetic potentials, and stress tensors. Lagrangian and Hamiltonian formulations, radiation from moving charges. Introduction to quantum electrodynamics. Prerequisite: EE 207. (Spring 1988 and every third year thereafter) (Braun)

233 **Microwaves and Components** (3)
High-frequency transmission lines and guided systems, matching techniques, scattering parameters, transfer parameters, directional couplers, cavity resonators, Faraday rotation, ferrite isolators and circulators. Prerequisite: EE 207. (Fall—evening) (Kahn)

234 **Electromagnetic Wave Propagation** (3)
Retarded time scalar, vector, and Hertz potential. Dipole and dipole array fields; Mie theory of electromagnetic scattering by spheres. Propagation in electrically and magnetically anisotropic media such as dielectric crystals, space-charge plasmas, and ferrites. Wave propagation in inhomogeneous media; Liouville transformation, Lagrange's variation of parameters, WKB solution, invariant imbedding techniques. Propagation in stochastic and dispersive media. Prerequisite: EE 207. (Spring, even years—evening) (Lang)

235 **Antennas** (3)
General solution of Maxwell's equations in terms of current sources, polarization, the far-field approximations, radiation from current distributions, field equivalence theorems, the geometrical optics approximation, aperture antennas, receiving antennas, the theory of arrays, and applications to specific antennas and antenna types. Prerequisite: EE 207. (Spring, odd years—evening) (Kahn)

236 **Plasma Dynamics** (3)
Study of the interaction of fluids with electromagnetic fields. Generalized Navier–Stokes and energy equations, magnetogasdynamic and magnetohydrodynamic approximations, boundary-layer theory, statistical theory of turbulence, generalized von Kármán–Howarth equation, Boltzmann transport equation. MHD generators and devices. Prerequisite: EE 207. (Fall 1986 and every third year thereafter) (Braun)

237 **Waves in Random Media** (3)
Propagation and scattering of electromagnetic, optical, and acoustic waves in random media, scattering from rough surfaces and randomly distributed particles, turbulence. Applications to propagation through rain and fog. Laser beam scintillations, remote sensing, and communications channel modeling. Computer simulation by Monte Carlo techniques. Prerequisite: EE 204, 207. (Fall, even years—evening) (Lang)

238 **Remote Sensing** (3)
Description and analysis of active and passive remote-sensing systems including scatterometers, real-aperture imaging, and synthetic-aperture radars. Sensing of surface, subsurface, and atmospheric parameters at microwave, infrared, and optical frequencies. Analysis of radiometric techniques using radiative transport theory, inverse scattering methods, profile inversion. Prerequisite: EE 207. (Spring, odd years—evening) (Lang)

239 **Numerical Laboratory in Electromagnetics** (3)
Numerical methods for the solution of electromagnetic problems dealing with scattering by complex shapes, antenna design, transmission through anisotropic and dispersive media, electrodynamic interactions with charged particles. Convergence experiments dealing with moment methods, hybrid GTD, variational computations. Prerequisite: EE 207, CSci 100. (Spring, even years—evening) (Kahn)

241 **Information Theory** (3)
Measure of information, noiseless coding. Communication channels, channel capacity, the noisy channel coding theorem. Bounds on the performance of communications systems. The Gaussian and binary symmetric channel. Feedback communications systems. Rate-distortion theory. Prerequisite: EE 204. (Fall—evening) (Pickholtz)

242 **Coding Theory** (3)
The PCM communication system, mathematics of coding; groups, rings, and fields. Linear codes: parity and generator matrices, syndrome error correc-

tion and deletion capability, minimum distance. Performance bounds of linear codes, Hamming and Golay codes, polynomial algebras and Galois fields, shift-register implementation. Cyclic codes: implementation and performance. BCH codes: encoding, decoding, minimum distance, the BCH decoding algorithm, burst-correction codes, convolutional codes, sequential and Viterbi decoding of convolutional codes. Prerequisite: EE 204. (Spring—evening) (Pickholtz)

243 **Communication Theory I** (3)
Optimum receivers for vector channels and for the additive white Gaussian noise channel; correlation detectors, matched filters; coherent and noncoherent detection and their error probabilities for simplex, orthogonal, and coded systems; bounds on the performance of communications in Gaussian noise; comparison of communications systems. Prerequisite: EE 204 or equivalent. (Fall—day and evening; Spring—evening) (Pickholtz)

244 **Communication Theory II** (3)
Schemes for efficient signaling for data sequences; effects of quantizing at the receiver. Practical implementation of orthogonal and simplex coded communication. Convolutional codes; bounds on performance decoding by sequential (Zigangirov–Jelinek, Fano) and MAP (Viterbi) algorithms. Fading and dispersive channels, diversity techniques and their performance. Topics from analog communications. Prerequisite: EE 243. (Spring—day and evening) (Pickholtz)

245 **Signal Detection and Estimation Theory** (3)
Statistical detection theory, hypothesis testing, sequential detection, estimation theory, maximum likelihood and Bayes methods, estimation of signal parameters and continuous waveforms, Wiener and Kalman filters, applications to the design of optimum receivers, adaptive systems. Prerequisite: EE 241, 244, or equivalent. (Fall—evening) (Pickholtz)

246 **Digital Communications** (3)
Analysis and design of digital communications systems for voice, video, and data. Digital coding of waveforms: uniform and nonuniform quantization, pulse-code modulation, digital multiplexers, and digital system hierarchy. Model and performance characterization of digital communications systems, baseband signaling technique, efficient modulation techniques for band-limited channels, baseband shaping and Nyquist criteria, intersymbol interference (ISI) and eye diagrams, partial response signaling, application of Viterbi algorithm to data transmission, system performance in presence of ISI and additive white Gaussian noise, optimization of two-dimensional signal constellations. Baseband representation of band-pass signals; BPSK, DPSK, QPSK, SQPSK, and MSK: power spectrum and performance; concept of multi-$h$ modulations; practical considerations in design of modems. Digital switching and integrated services digital networks. Prerequisite: EE 243, 244. (Fall—evening) (Pickholtz)

247 **Communications Systems** (3)
Analysis and design of digital communications systems. Generation of coherent references: phase-locked loops, linear and nonlinear model of PLL in the presence of additive noise, optimum design of PLL. Synchronization of digital communications systems: maximum-likelihood parameter estimation and application in carrier-phase and symbol-timing recovery, performance degradation due to imperfect phase and bit timing, frame synchronization techniques and application to PCM and TDMA systems, synchronization of switched digital communications networks. Spread-spectrum signals for digital communications, digital switching and integrated services digital networks, selected topics in design of digital communications networks, case studies. Prerequisite: EE 243, 244; or equivalent. (Spring—evening) (Pickholtz)

248 **Computer Communication Networks I** (3)
Introduction to data networks, common carriers, specialized carriers, and value-added networks. Operations, facilities, services, and tariffs. Data

transmission over the telephone network. Channels, carrier systems, and hierarchies. Terminals, modems, multiplexers, concentrators, and communications processors. Coding for baseband transmission and error control. Data transmission via satellites. Local area networks. Interfaces and protocols. Should be taken in sequence with EE 249. (Fall) (Helgert)

249 **Computer Communication Networks II** (3)
Design and analysis of computer communication networks. Circuit and packet switching. Traffic theory for data. Queuing models. Buffer design and statistical multiplexing. Delay and cost minimization, topological design algorithms. Network routing and flow control. Analysis of multiple-access algorithms. Should be taken in sequence with EE 248. Prerequisite: EE 204. (Spring) (Helgert)

250 **Telecommunications Security Systems** (3)
Mathematical theory of cryptography. Speech and data scrambling. Nonlinear transformations. Block and stream ciphers. DES algorithm and public key cryptography. Applications to data communications. Key management, digital signatures, and authentication. Data communication security protocols, OSI security architecture. Transaction-oriented security. Secure voice communications. Companion course to CSci 229. Prerequisite: EE 204. (Spring, odd years—evening) (Pickholtz)

251 **Switched Telecommunication Networks** (3)
Switching technology: step-by-step, common control, stored program, electronic switching systems. Traffic models. Engineering of multiple server systems; analysis of multistage connecting networks. Digital time division and store and forward switches. Analytical bounds on the complexity of switched networks. Hybrid circuit-message switching. Large-scale switches, PEABX, and distributed switched networks. Prerequisite: permission of course director. (Spring, even years) (Pickholtz)

252 **Digital Signal Processing Techniques** (3)
Signal representations, sampling and quantization, transform techniques. Recursive estimation, linear predictive filtering, recursive and nonrecursive digital filter design. Computer-aided design. Prerequisite: CSci 51 or equivalent. (Fall, even years) (Zaghloul)

254 **Radar Systems** (3)
The radar equation, range and resolution limits; MTI radars; detection and estimation techniques; clutter characteristics and detection in clutter; signal design; ambiguity functions; Doppler radar; phased arrays; synthetic-aperture techniques; digital and optical processing and computer control. Applications. Prerequisite: EE 206, 243. (Spring—evening) (Helgert)

255 **Optical Processing** (3)
Fourier transforms by diffraction of light, optical spectrum analysis, optical memories and systems, holography and holographic techniques, properties and techniques for photographic reproduction. Prerequisite: EE 201. (Fall, even years—evening) (Kahn)

257 **Secure Communications** (3)
Spread-spectrum techniques, time and frequency hopping, direct sequence encoding. Link jamming models and jamming effectiveness. Adaptive null steering arrays, nulling algorithms, effects of intelligent jammers. Low probability of intercept. Prerequisite: EE 243. (Fall, even years) (Pickholtz)

258 **Radio Communications Systems I** (3)
Analysis and design of microwave communications systems for terrestrial, satellite, and over-the-horizon scatter radio channels. Propagation effects and channel characterization including refraction, reflection, multipath, scattering, and absorption. Effects of Earth curvature and characteristics of overland and over-water propagation. Antenna considerations including gain, directivity, polarization, and antenna patterns. Frequency and time-

division multiplexing and modulation techniques. Effects of noise, interference, and fading. Diversity techniques. Prerequisite: EE 206, 244. (Fall—evening) (Lang)

259 **Radio Communications Systems II** (3)
Morphology of the ionosphere, propagation of ionospherically reflected radio waves, anomalous ionospheric propagation mechanisms, linear antenna structures, atmospheric noise, digital modulation techniques, non-Gaussian channel performance, diversity, fading channel error control, typical VLF, LF, and HF system design. Prerequisite: EE 258 or permission of instructor. (Spring—evening) (Lang)

261 **Electromechanical Energy Conversion** (3)
Characteristics of synchronous machines, synchronous reactance, reactance theories, synchronizing generators and parallel operation of machines, characteristics of asynchronous machines, machines as circuit elements. Steady-state and dynamic performance of alternating current machines. Prerequisite: EE 202, 206, or permission of course director. (Fall—evening) (Harrington)

262 **Power Electronics** (3)
Dynamic requirements of industrial drives. Detailed analysis of inverter circuits. Frequency control of inverter drives and cycloconverters. Computer modeling of rectifier and inverter circuits. Feedback control loops and their effect on stability. Prerequisite: EE 177 or permission of course director. (Spring—evening) (Harrington)

263 **Design of Reliable Emergency and Standby Power Systems** (3)
General requirements and guidelines. Factors affecting power-line disturbances. Characteristics and settings of system protection. Disturbance effects on computer power supplies. Grounding and noise control. Evaluation of reliability of power systems. Reliability evaluation from an economic viewpoint. Cost of power outages. Reliability of specific equipment. Practical application problems. Prerequisite: EE 202, 206, or permission of course director. (Spring—evening) (Harrington)

264 **Direct Electrical Energy Conversion** (3)
Theory and practice for direct production of electricity using solar cells, thermionic converters, fuel cells, and batteries. Concepts of solid-state energy bands, work function and conversion efficiency, and limitations. Prerequisite: EE 202, 206, and permission of course director. (Fall—evening) (Harrington)

265 **Transients in Electrical Power Transmission Lines** (3)
Theory of traveling wave phenomena in electrical power transmission lines. Switching and lightning surges and the resultant overvoltages on long lines for various terminations. Breaker closing sequence effects and effect of source side inductance and multiple infeeds. Recovery voltage after short line faults. Methods and effectiveness of protection. Analysis of transient corona and its effect on wave shape. Methods of automatic calculation of overvoltages in complex systems and insulation level requirements. Prerequisite: EE 202, 206, or permission of course director. (Fall, odd years—evening) (Harrington)

266 **Electrical Power Transmission I** (3)
EHV AC power transmission. Overhead line and underground cable transmission systems. Symmetrical components; short-circuit studies; load flow, transient stability, and sustained fault analysis; multimachine systems; machine and system modeling. Prerequisite: EE 178, 261, 265. (Spring, even years—evening) (Harrington)

267 **Electrical Power Transmission II** (3)
Practical studies using a computer in the following areas: load-flow analysis, short-circuit analysis, transient stability, design of power system networks, insulation coordination. Prerequisite: EE 266. (Fall, even years—evening) (Harrington)

268 **Electrical Power Distribution** (3)
Transformer and insulation design at distribution voltage levels. Medium- and low-voltage switchgear requirements. Protective relaying, harmonic filtering, power-factor correction, grounding systems. Prerequisite: EE 178, 202, and permission of course director. (Spring, odd years—evening) (Harrington)

269 **Issues in Electrical Power Generation and Transmission** (3)
Assessment of various energy systems. Interfacing of different types of energy systems. Dispersed generation; concepts of conversion and cogeneration. Pollution control. Biological effects of high electric and magnetic fields. Prerequisite: EE 264, 265, 267, and permission of course director (Spring, odd years—evening) (Harrington)

271 **Linear Multivariable Control Theory** (3)
Control of systems having multiple inputs or outputs. Topics useful in the control of multivariable systems, including the algebraic theory of multivariable feedback; static and dynamic decoupling; invertibility; modal control; integrity; and computer-aided frequency-domain techniques, such as feedback design, using inverse Nyquist arrays and characteristic loci design. Prerequisite: EE 172, 202, or equivalent. (Spring, even years) (Carroll)

272 **Computer Control Systems** (3)
Analysis of automatic control systems in which the control procedure uses on-line digital computation. Topics include single- and multirate sampling, *z*-transforms, responses of discrete systems, stability criteria, and discrete control design. Prerequisite or concurrent registration: EE 202. (Fall) (Carroll)

273 **System Optimization** (3)
Parameter optimization problems, theory of minima and maxima. Optimization problems for dynamic systems, calculus of variations, the maximum principle and the Hamilton–Jacobi equation. Optimization problems with constraints, optimal feedback systems. Numerical solution of optimal problems. Prerequisite: EE 203 or equivalent. (Spring—evening) (Carroll)

274 **Nonlinear Systems** (3)
Definition of linear and nonlinear systems; introduction to approximate analysis of nonlinear systems—describing functions, Krylov and Bogoliubov asymptotical method, and Tsypkin locus. Forced oscillations—jump resonance. Stability analysis—Liapunov criterion. Luré problem and Popov method. Prerequisite: EE 203. (Spring, odd years—evening) (Carroll)

275 **System Identification and Adaptive Control Systems** (3)
Identification is the process of mathematically modeling a system based on measurement data that may be limited or uncertain. Adaptive control is the means whereby a system that is poorly modeled is adequately controlled. Various approaches to each of these problems are discussed, including the least-squares approach of identification and the stability approach to adaptive control. Prerequisite: EE 202, 204. (Spring, even years) (Carroll)

277 **Satellite Communications Systems** (3)
Theory and applications of satellite communications. Modulation and multiple-access techniques. Link design. Satellite transponders and antenna systems. Ground stations. Random-access techniques and satellite packet communications. Prerequisite: EE 244. (Fall—evening) (Pickholtz)

278 **Spacecraft Systems Design** (3)
Space environment; structure, propulsion, control, and instrumentation of spacecraft—launch, orbit, transit, and reentry problems; bioastronautic considerations. Prerequisite: graduate status. (Spring, even years—evening) (Heller)

279 **Stochastic Control Systems** (3)
Introduction to random process in control systems. Properties of Markov process, systems of covariance equivalence and of deterministic and stochastic control equivalence; dynamic programming for Markov process—

principle of optimality; linear systems with quadratic cost, Kalman filtering, smoothing, and predicting. The separation theorem and applications concepts of adaptive estimations. Prerequisite: EE 204, 273. (Fall, odd years) (Lee)

280 **Introduction to Medicine for Engineers I: Physiology and Anatomy** (3)
The physiology of the human body from a systems viewpoint; concepts of cellular structure and function integrated into the tissue and organs and related to the various systems of the body; interrelationships of the body systems, such as the interaction of the nervous system with the musculoskeletal system or the interaction of the respiratory system and its functions with the cardiovascular system. (Fall—evening) (Eisenberg)

281 **Introduction to Medicine for Engineers II: Physiology and Anatomy** (3)
Further elaboration of physiological systems, such as the endocrine system, renal physiology, gastrointestinal physiology; integration of the separate systems to present the functioning of the body as an overall system. Prerequisite: EE 280. (Spring—evening) (Eisenberg)

282 **Medical Measurements I** (3)
Theory of measurements in biological areas, techniques for electronic measurements on biological specimens, current problems in medical metrology, stressing electronic systems. Prerequisite: EE 280 or permission of course director. (Fall—evening) (Eisenberg)

283 **Medical Measurements II** (3)
Medical telemetry systems, medical use of the computer, engineering techniques in patient treatment, principles of good medical instrumentation. Prerequisite: EE 280 or permission of course director. (Spring) (Eisenberg)

285 **Evoked Potentials I** (3)
Physiological significance of the sensory-evoked potentials, stimulation variables, subject variables, data acquisition procedures and instrumentation, signal-averaging computers, analysis techniques for the VEP, applications of the VEP. Lectures, discussion, and laboratory. Prerequisite: EE 280, 281, 282, 283; or permission of course director. (Fall—evening) (Eisenberg)

287 **Rehabilitation Engineering** (3)
Cross-sectional view of those areas of medicine most involved with the treatment of handicapped individuals. Application of engineering theory and techniques to the rehabilitation of handicapped individuals. Major problem areas and general solutions, solutions to some specific problems. Prerequisite: EE 289. (Spring, odd years) (Eisenberg)

289 **Clinical Engineering** (3)
Overview of clinical medicine with emphasis on those areas most affected by engineering and technology. Prerequisite: EE 280, 281, 282, 283. (Fall, even years) (Eisenberg)

297 **Special Topics in Electrical Engineering** (1 to 3)
Topic to be announced in the *Schedule of Classes*. (Fall and Spring)

298 **Research** (arr.)
Applied research and experimentation projects, as arranged. May be repeated for credit. (Fall and Spring)

99–300 **Thesis Research** (3–3)
(Fall and Spring)

319 **Systems Science, Networks, and Controls Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

321 **Approximate Mathematical Techniques for Electromagnetics** (3)
Asymptotic methods for Maxwell's equations, geometric optics, WKB approximation for stratified media, uniform expansion near a caustic and shadow

boundary. Perturbation techniques for tenuous medium: Rayleigh–Gans approximation, smoothing, and multivariable methods for stochastic problems. Prerequisite: EE 204, 207. (Spring 1988 and every third year thereafter) (Lang)

322 **Advanced Waveguide Diffraction and Design** (3)
Selections from the following. Analytical treatment of waveguide bifurcations and discontinuities by Wiener–Hopf, mode matching, static approximation, and other techniques. Small apertures (obstacles) in waveguides. Variational methods for evaluation of equivalent circuit parameters. Group theoretic methods for symmetrical junctions. Prerequisite: EE 233. (Fall, every third year) (Kahn)

323 **Principles of Microelectronics** (3)
Basic principles, techniques, and processes necessary for understanding microelectronics. Semiconductor physics, phase diagrams, crystal growth, epitaxy, vacuum techniques, thin-film deposition, diffusion, oxidation, junction formation, masking, and properties of thin films and materials. Prerequisite: EE 222 or equivalent. (Fall, odd years—evening) (Heller)

329 **Electrophysics Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

335 **High-Resolution Antenna Array Processing Techniques** (3)
Review of electromagnetic-wave propagation; radiation and reception by array antennas; antenna arrays as multiport receivers; signal and noise models for radar detection and wave-front reconstruction. Angle-of-arrival estimation using the maximum entropy, autoregressive moving-average techniques, and singular-value decomposition. Application to radar multipath problems, low-elevation tracking radar, and angle-of-arrival estimation. Prerequisite: EE 204, 207. (Fall, even years) (Wasylkiwskyj)

345 **Advanced Detection Theory** (3)
Review of general estimation equations. Linear estimation, Weiner and Kalman–Bucy filters, nonlinear modulation theory. Angle-modulation systems, analysis and design of phase-lock loops, optimum angle modulation, rate-distortion theory. Gaussian processes in Gaussian noise, detection and parameter estimation, canonical receivers, structures, and performance calculations for diversity systems, multiple-pulse radars, stationary processes, and threshold receivers. Prerequisite: EE 245. (Spring—evening) (Pickholtz)

346 **Telecommunications Protocols** (3)
Layered protocol models for computer communications networks. Open systems interconnection reference model. CCITT and ISO protocol standards in support of OSI. Proprietary communications architectures. SNA and DNA. Protocols for local area networks and integrated services digital networks. Prerequisite: EE 248. (Fall, even years) (Helgert)

347 **Telecommunications Software Engineering** (3)
Formal description techniques for protocol specification. Graphic and matrix representations of finite-state protocol models. Specification and Description Language (SDL) and CCITT High-Level Language (CHILL). Software implementations of computer communications protocol architectures. Network management and control programs, telecommunications access methods, file transfer programs, electronic mail systems, and document interchange architectures. Terminal emulations. Selected programs for OSI and SNA link, network, transport, and session layers. Prerequisite: EE 248, 346. (Spring—odd years) (Helgert)

349 **Communications Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

364 **Applications of Direct Energy Conversion** (3)
Electrostatic and magnetic conversion systems, conversion of heat to electricity, thermoelectric systems, conversion of light to electricity, fuel cells and

batteries, magnetohydrodynamic systems, superconductive machines and systems. Prerequisite: EE 264. (Spring, even years) (Harrington)

368 **High-Voltage Testing Techniques for Electrical Apparatus** (3)
Methods and procedures for measurement of high voltage; basic testing techniques for alternating voltages, direct voltages, lighting-impulse voltages, switching-impulse voltages, and impulse currents for conducting tests on all types of apparatus. General applications and requirements regarding test objects and test procedures. Determination of the dielectric strength of electrical insulation materials at commercial power frequencies. The use of sphere gaps for the measurement of peak values; the geometry of the standard sphere gap, its connections and use. Procedures for wet tests, contamination testing, and an application guide for measuring devices. (Spring, even years—evening) (Harrington)

371 **Simulation Methods for System Analysis** (3)
Survey of simulation languages. Techniques of model building for material- and machine-based systems. Treatment of these systems with notion of transactions and states. Modeling the dynamic processes of growth problems. Analog, hybrid, and digital methods for simulation treated by means of case studies; speed and cost of alternate computing procedures. Project-type problems used to illustrate simulation methods. Prerequisite: CSci 278 or permission of course director. (Fall, odd years—evening) (Bock)

372 **Analysis and Control of Large Systems** (3)
Systems as multistage decision processes. Analytical concepts of model making and matrix representations of large systems. Approximation by models of lower dimension: reduction to simplified models, decentralized systems. Differential games, computation of saddle points, construction of an equilibrium point. Prerequisite: EE 273. (Fall, even years—evening) (Lee)

381 **Computer-Aided Analysis of Physiological Signals** (3)
Computer analysis of physiological data obtained from the cardiovascular, pulmonary, and nervous systems. Sources and detection of various signals obtained from these systems, preprocessing of real signals, algorithmic techniques applicable to the analysis of these signals. Students are provided with real data and develop computer software for determining pertinent medical parameters as established by physicians. Prerequisite: EE 280, 281, 282, 283. (Fall, even years—evening) (Loew)

382 **Physiological Controls and Systems** (3)
Some applications of control and systems theory in the medical and biological fields. Application of general control and systems theory as applied to physiological systems. Specific applications of control and systems theory to the visual system, respiratory system, cardiovascular system, and musculoskeletal system. Prerequisite: EE 172 or equivalent, 280, 281, 282, 283. (Spring, even years—evening) (Loew)

384 **Medical Imaging** (3)
Principles of medical imaging by projection radiography, fluoroscopy, tomography, ultrasound, and nuclear sources. Characterization of source and object; recorder resolution and noise; analysis of scatter, energy considerations; attenuation; computerized tomography. Mathematics, algorithms, and implementation. Ultrasonic imaging in A-, B-, and M-modes; tissue characteristics; imaging using arrays. Nuclear imaging with gamma-ray cameras, Anger camera, positron-emission tomography. Prerequisite: EE 201 or equivalent, 280, 282, 283. (Fall, odd years—evening) (Loew)

385 **Evoked Potentials II** (3)
Continuation of EE 285. Advanced lecture, discussion, and laboratory. Current topics in sensory-evoked potentials research, with emphasis on clinical applications. Planning and conducting of an advanced (clinical or research) project chosen to take maximum advantage of the student's

technical background in instrumentation, computers, and data analysis. Prerequisite: EE 285 and permission of course director. (Spring, odd years—evening) (Eisenberg)

386 **Bioelectromagnetics** (3)
Electrical properties of biological tissues. Mechanisms for electromagnetic interactions with biological systems. Energy absorption and heat production. Non-ionizing radiation dosimetry and quantification of microwave and radio frequency hazards. Temperature measurement in the presence of a strong electromagnetic field. Physical aspects of diathermy and hyperthermia. Other therapeutic and diagnostic applications of electromagnetic energy. Prerequisite: EE 31, 32, 280, 281; or permission of instructor. (Fall, odd years—evening) (Eisenberg)

387 **Bioelectric Phenomena** (3)
Mathematical treatment of selected bioelectric phenomena. Membrane thermodynamics, membrane electrical potentials and subthreshold membrane effects, membrane dynamics. Solid-state phenomena in biology and medicine. Photoconduction. Mechanism of nerve propagation. Electrical models of the heart. Cell physiology. Quantum effects in biological systems. Prerequisite: EE 206, 280, 282, 283. (Spring, even years—evening) (Loew)

389 **Medical Engineering Research** (arr.)
Limited to students working on the Doctor of Science dissertation. May be repeated for credit. (Fall and Spring)

390 **Colloquium** (0)
Lectures by outstanding authorities in electrical engineering and computer science. Topics to be announced each semester. (Fall and Spring) (Lang)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

450 **Telecommunications System Concepts** (3)
Essential elements of an electrical communications system: speech, TV, and data signals; spectrum, bandwidth, sampling. Amplitude, frequency, and pulse-code modulation and comparative performance. Multiplexing schemes. communications quality standards and objectives. Signal power, noise power, distortion, and channel capacity. Probability; traffic theory; reliability; voice, TV, and data transmission. Telecommunications, microwave-radio, cable, and satellite-communications system. May not be applied toward a graduate degree in the School of Engineering and Applied Science. (As arranged) (Pickholtz)

451 **Survey of Telecommunications Systems** (3)
Design of a communication link for voice, TV, and data. Loading, the switched telephone network. Transmission system layout and major design considerations. Overall design of microwave-radio system. Radio-wave propagation. Satellite communications, factors affecting the choice of orbit and orbital separation of satellites, satellite transponder. Major design considerations and values of significant parameters for a typical satellite communication link. Overall design of a cable communication system. Digital transmission and terminals. Wideband data transmission. Frequency allocation. May not be applied toward a graduate degree in the School of Engineering and Applied Science. (As arranged) (Pickholtz)

## Computer Science Graduate Courses

The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

201 **Introduction to Computer Systems** (3)
Introduction to programming digital computers in high-level and assembly languages. Architecture of traditional von Neumann and stack-based com-

puters. Techniques in machine control and memory addressing. Number systems and codes. Software engineering. Introduction to parsing, compiling, and meta-language. Stacks and recursion. CSci 201 is equivalent to CSci 147 or 157, and 158. May not be taken for graduate credit by majors in computer science. Prerequisite: CSci 51 or equivalent (Pascal) and programming experience using assembly language. (Fall and Spring—evening) (Bock)

203 **Microprocessors and Microcomputers** (3)
Unified approach to the design of 8-, 16-, and 32-bit microprocessor-based systems. Microprocessor (CPU) and system architecture. PMS- and ISP-level description. Instruction formats and microprocessor programming. Microprocessor arithmetic. Operation and bus-timing diagrams. CPU and systems buses and signals. Hardware–software design equivalence. RTL description of a microprocessor, advanced architectural and systems concepts. Memory and I/O system design and interfacing techniques. Memory management techniques and structures. Bit-sliced microprocessors. Prerequisite: CSci 147 and 154 or permission of course director. (Fall and Spring) (Alexandridis)

212 **Discrete Analysis in Computer Science** (3)
Formal systems, fundamentals of graph theory, combinatorics and combinatorial algorithms, complexity theory, discrete probability, and the generation of random variables and sequences. Applications to the analysis of algorithms, simulation, and other problems in computer science. Prerequisite: CSci 161 or permission of instructor. (Fall—evening) (Berkovich)

215 **Advanced Data Structures** (3)
Sparse matrix transpose and multiplication. List insertion and deletion, lists of available space. The boundary tag method, the Deutsch–Schorr–Waite algorithm, the Knuth–Morris–Pratt algorithm. In-order, preorder, and postorder traversal of trees, alpha–beta pruning. Tarjan's UNION and FIND. Depth-first and breadth-first search, Kruskal algorithm, topological sorting, shortest paths in a graph. Quick sort, heap sort, radix sorting, merge sorting, sorting of files. Binary search trees, including AVL trees, B-trees, and tries. Hashing and collision handling. Critical paths and PERT. Prerequisite: CSci 158, 159, 161. (Spring—evening) (Berkovich)

216 **Information Retrieval Systems** (3)
Information organization and retrieval of natural language data by digital computer systems; statistical, syntactic, and logical analysis of natural language used for retrieval systems; dictionary systems, including thesaurus look-up and phrase structures; searching strategies and cataloging. Input preparation and output structures; large-scale file structures and operating systems required for their use. Prerequisite: CSci 158, 159; or permission of course director. (Spring—evening) (Berkovich)

217 **Computing Algorithms** (3)
Design and analysis of five classes of algorithms: greedy dynamic programming, tree and graph traversals, backtracking, branch-and-bound. Applications to problems such as sorting and searching, graph coloring, traveling salesperson, knapsack, and code generation. Lower bound theory. NP-hard and NP-complete problems. Prerequisite: CSci 158, 159, 161. (Fall and Spring—evening) (Berkovich)

219 **Interactive Computer Graphics II** (3)
Raster display system architecture and display technologies. Clipping and scan-conversion algorithms. Three-dimensional homogeneous coordinates and viewing. Visible-surface determination and shading models. Prerequisite: CSci 185, 217 or 258. (Spring—evening) (Sibert)

220 **Pattern Recognition** (3)
Applications of pattern recognition, vector spaces, estimation and samples; Bayes estimation; density functions; stochastic approximation; decision rules in pattern recognition, minimal risk, Gaussian filters; bounds of risk, nearest-neighbor decision rules; clustering techniques, feature extraction.

Sequential and nonparametric methods. Pattern recognition with *a priori* knowledge. Introduction to syntactic methods. Computer applications and projects. Prerequisite: EE 204. (Fall—evening) (Loew)

221 **Machine Learning** (3)
Learning as an alternative to traditional, rule-based schemes for artificial intelligence. Game theory: a formalism for specifying interactive processes. Deterministic and probabilistic simulation of games. Random number generation and testing. Markovian and bounded-context systems. The algedonic process. Introduction to collective learning systems theory. Design, simulation, and evaluation of collective learning automata. Case studies, readings, and projects. Prerequisite: CSci 174, 232; or permission of course director. (Fall—evening) (Bock)

222 **Design of User–Computer Dialogues** (3)
Design of dialogues for interactive terminal systems, including graphics systems. Psychological, physiological, linguistic, and perceptual factors. Advantages and disadvantages of various interaction techniques, command language syntaxes, and data presentations. Design methodology and guidelines. Case studies, research readings, and projects. Prerequisite: CSci 158, 159; or permission of course director. (Spring—day or evening) (Foley)

224 **Artificial Intelligence** (3)
Survey of topics. Analogies and simple concepts. Symbol manipulation and programming in LISP. Networks and simple learning. Scene and sentence analysis. Programming the BLOCKS world. Depth-first and breadth-first searching, hill climbing, network searching, min–max and alpha–beta pruning. Problem-solving systems. Prerequisite: CSci 174, 232. (Fall and Spring—evening) (Garcia)

226 **Robotics** (3)
Industrial automation. Manipulator and sensor technology. Feedback loops and analog servos. Multiple degrees of freedom and coordinate systems. Joint-space–work-space transformations and data structures. Point-to-point continuous path control. Robot control: command languages, navigation and mapping, optical and acoustic ranging and pattern recognition, collision-avoidance algorithms, positioning accuracy, resolution, and repeatability. Distribution of intelligence. Adaptive hierarchical control. Class projects using the Mobile Robot in the Interactive Systems Lab. Prerequisite: CSci 174 or permission of course director. (Spring—evening) (Bock)

227 **Management Information Systems and Database Management** (3)
Concepts in management information systems. Commercial programming features of COBOL and PL/1. Inverted files and query systems. Editing, report generation, updating, and updating load. Trade-off between direct access and indexed-sequential access. Maintaining large programming systems that lead to the need for database management systems; construction of database management systems. Survey of some existing database systems. Relational database concepts and future developments. Conceptual and logical design of a data base. Prerequisite: CSci 158, 159. (Fall—evening) (Rotenstreich)

229 **Computer Security Systems** (3)
Techniques for security of data and programs in computer systems. Authentication methods, logging, authorization, encryption, statistical inference controls. Effects of operating systems and machine architecture on security. Cost trade-offs among various countermeasures. Information flow models. Automated and manual risk-analysis systems. Related nontechnical measures. Companion course to EE 250. Prerequisite: CSci 158, 159; or equivalent. (Fall—evening) (Hoffman)

230 **Information Policy** (3)
Topics of current interest in information policy, including privacy, freedom of information, antitrust and other business implications of policies, trans-

border data flow, information as a weapon, cryptographic policy, international aspects of information law and policy, technology transfer, electronic funds transfer, electronic mail, criminal justice information systems, and cross-cultural implications and the lower classes. May not be taken for graduate credit by majors in computer science. Prerequisite: CSci 100 or equivalent. (Spring, even years) (Hoffman)

231 **Sequential Machines** (3)
Finite-state sequential machine theory and design, state identification, information losslessness, state minimization in incompletely specified tables, partition theory, decomposition of machines, asynchronous machine design, structural simplicity, and design with ROMs and PLAs (planar logic arrays). Prerequisite: CSci 153, 161. (Fall, even years—evening) (Friedman)

232 **Automata and Formal Languages** (3)
Regular expressions including equality and transformations between sequential machines and regular expressions. Turing machines, recursive functions, predicate calculus, and computability. Complexity of algorithms. Formal language theory, including grammatical construction, recognizers, relationships between machines and grammars. Nondeterministic automata. Prerequisite: CSci 153, 158, 159, 161. (Fall and Spring—evening) (Feldman)

237 **Computing Systems I** (3)
Organization of large computing systems. Design of high-speed integer decimal and floating-point arithmetic units. Pipelined instruction and execution units. Array and vector processors, multiprocessors and overlap. Look-ahead and parallelism in control processors. Trends in processor design. Prerequisite: CSci 147, 154. (Fall and Spring) (Meltzer)

238 **Computing Systems II** (3)
Organization of large computing systems. Memory hierarchy. Analysis and design of cache memory, main memory technology. Analysis of interleaved memory. Secondary storage devices. Analysis of data movement from secondary storage. Virtual memory systems. Input/output subsystems and channels. Analysis of I/O overlap. Introduction to computer networking. High-reliability architectures. Prerequisite: CSci 147, 154. (Spring) (Meltzer)

239 **Comparative Computer Systems** (3)
Structures of computers and a general language for system description. History of different computer structures. Development of the operating system. Special purpose processors. Multiprocessors and large computing systems. Computer networks and time-shared systems. Comparison of computer families. Characteristics and philosophies of computer design of the major manufacturers. Introduction to performance evaluation and measurement. Effects of software and technology on computer structures. Prerequisite: CSci 237. (Spring—evening) (Meltzer)

240 **Theory and Practice of Microprogramming** (3)
Basic concepts, techniques, and theory of microprogramming as applied to the implementation of control systems for sequential machines. Microprogramming languages, assemblers, and hardware simulators, including specific applications of these to the design of current computer systems and their interfaces with real-time systems. Prerequisite: CSci 147, 237. (Spring, even years—evening) (Friedman)

243 **Fault-Tolerant Systems and Design Automation** (3)
Fault-test generation for combination and sequential circuits, digital simulation as a diagnostic tool, design of easily tested and fault-tolerant systems. Physical packaging of digital circuits; design of circuit boards, including partitioning, placement, and interconnection of elements. Prerequisite: CSci 153. (Fall, odd years—evening) (Friedman)

244 **Data Communications** (3)
Principles and practice of modern data communications. Modes for data transmission; terminals, modems, multiplexers, concentrators. Line control

procedures. Protocols for buffer management, message reassembly, queue control. Distributed processing; terminal-oriented systems, data-collection loops, multidrop lines. Switched data systems; circuit and packet switching. Error control, cryptosecurity. Hardware and software interfacing. Prerequisite: CSci 147 or 157, 154, 158, 159; or permission of course director. (Spring—evening) (Meltzer)

245 **Advanced Computer Systems Theory I** (3)
Fundamentals of performance evaluation of digital computer systems. Queuing models of computer systems and applications of queuing theory to computer modeling. Bounds on system performance. Mean-value analysis of computer systems. Modeling specific subsystems, such as memory, disks, and processors. Use of queuing models for analysis of existing and proposed systems and for capacity planning. Limitations of queuing models. Analysis of transaction processors, terminal-oriented systems, and batch processing. Prerequisite: CSci 237. (Fall—evening) (Meltzer)

246 **Advanced Computer Systems Theory II** (3)
Methods of performance evaluation: measurement techniques and tools; instrumentation and simulation methods; analytical techniques, including analysis of CPU–I/O overlap. Work-load characterization, artificial and synthetic work loads. Performance comparisons, capacity planning using modeling. Evaluation of program performance. Improvement of performance through use of timing methods and data placement based on analysis of memory hierarchy. Prerequisite: CSci 245. (Spring—evening) (Meltzer)

247 **Languages for Systems Programming** (3)
Use of a macroassembler in structured programming. Conditional assembly. Design and programming of an assembler, macrogenerator, and loader. Prerequisite: CSci 147, 159. (Spring—evening) (Maurer)

255 **Analysis and Correctness of Algorithms** (3)
Basic tools of analysis of algorithms. Space and time measures, O(n) and O(f(n)), computer time versus programmer time. Divide-and-conquer, backtracking, branch-and-bound. Lower bounds on computations. NP-hard and NP-complete problems. Correctness, partial correctness, termination, run-time errors. The inductive assertion method, verification conditions and their generation and proof. Applications to algebraic and assembly languages. Prerequisite: CSci 161, 258. (Fall—evening) (Maurer)

256 **Design of Translators** (3)
Introduction to programming language implementation. Overview of compilers, interpreters, and assemblers. Lexical analysis. Introduction to classical parsing techniques. Symbol tables and static semantic analysis. Code generation and run-time environments. Writing a recursive-descent compiler for a simple block-structured language. Prerequisite: CSci 232, 258. (Spring—evening)

258 **Advanced Programming Languages** (3)
Issues in modern programming languages. Data abstraction. Classical and experimental control structures. Exception handling. Portability and standardization of programming languages. Student programming projects will compare alternative models as embodied in languages such as Ada, Modula-2, LISP, Snobol4, C, and APL. Prerequisite: CSci 158, 159, 161. (Fall and Spring—evening) (Feldman)

267 **Operating Systems I** (3)
Introduction to the operating system for batch-oriented, multiprogrammed computer systems. Software components that constitute the operating system. Facilities of the macroassembler utilizing the operating system, loading and linking routines, initializing programs and tasks, dispatching and the interrupt mechanisms. Memory management in fixed and variable partitions, device and storage management. Input–output control and use of access methods. Performance evaluation. Prerequisite: CSci 215 or 217. (Fall—evening) (Rotenstreich)

268 **Operating Systems II** (3)
Introduction to operating systems for time-shared and multiprocessor computer systems. Processor management in a multiprocessor system; deadlocks, processor utilization, and I/O management. System availability and fail-safe mechanisms. Time-slicing and time-sharing operating systems and subsystems, transaction-processing subsystems, memory management in a paged and segmented virtual memory system. Performance of the operating system. Computer network software and introduction to the computer as a utility. Introduction to security and large database management. Prerequisite: CSci 267. (Spring—evening) (Rotenstreich)

270 **Software Engineering** (3)
The life-cycle model. Requirements and specifications. Design models, structured and object-oriented design. Program development, PDL's tools, configuration control. Program, unit, and integration testing. Program verification. Other development models. Development metrics. Computer-aided software engineering (CASE). Prerequisite: CSci 217, 258. (Spring—evening) (Rotenstreich)

281 **Numerical Solutions of Algebraic Systems** (3)
Numerical solutions of linear algebraic equations and the algebraic eigenvalue problem. Sparse matrix techniques. Solutions of nonlinear simultaneous equations. Multidimensional search algorithms. Interpolation and extrapolation. Prerequisite: CSci 155. (Fall) (Della Torre)

282 **Numerical Solution of Ordinary Differential Equations** (3)
Classical treatment of numerical solutions of problems in one dimension, with emphasis on the application of the calculus of finite differences in the derivation of the various methods. Error analysis and the propagation of errors; Lagrangian interpolation; interpolation in tables and the calculus of finite differences; numerical quadrature; zeros of functions and zeros of polynomials; solution of ordinary differential equations by finite difference, predictor–corrector, and Runge–Kutta methods; boundary-value and eigenvalue problems of ordinary differential equations. Prerequisite: advanced calculus. (Spring, even years) (Della Torre)

283 **Numerical Solutions to Field, Wave, and Diffusion Problems** (3)
Finite difference, finite element, and boundary element methods. Eigenfunction solutions. Boundary approximation. Graphical presentation of results. Convergence acceleration techniques. Prerequisite: CSci 281. (Spring, odd years) (Della Torre)

285 **Approximation of Functions and Data Representations** (3)
Review of linear spaces; least squares, orthogonal functions; nonlinear techniques, gradient search methods; parameter estimation with discrete data; Tchebysheff approximation; approximation and curve fitting by spline functions and Bernstein polynomials. Prerequisite: CSci 281. (Fall—evening, at NASA–Langley Research Center; Fall, odd years—evening, on campus) (Meltzer)

297 **Special Topics in Computer Science** (1 to 3)
Topic to be announced in the *Schedule of Classes.* (Fall and Spring)

298 **Research** (arr.)
Applied research and experimentation projects, as arranged. May be repeated for credit. (Fall and Spring)

99–300 **Thesis Research** (3–3)
(Fall and Spring)

319 **Interactive Computer Graphics III** (3)
Parametric cubic curves and bicubic surfaces. Color models. Stochastic modeling. Multiple-processor display system architectures. Window managers and user interface management systems. Current topics. Prerequisite: CSci 217, 219, 237. (Fall, odd years—evening) (Foley)

321 **Advanced Machine Learning** (3)
A universal model for the structure and function of collective learning systems. Design, application, and performance evaluation of collective learn-

ing automata. Efficient data structures for transition spaces. Forward and backward contexts. Stationary/nonstationary and progressive/nonprogressive policies. Environment, compensation, update, and selection policy alternatives. Metrics for performance evaluation of collective learning automata. Self-organizing, hierarchical networks of learning cells. Genetic and evolutionary models for reproduction and expiration of automata. Prerequisite: CSci 221, 224. (Spring—evening) (Bock)

322 **Natural Language Understanding** (3)
Survey of the state of the art of natural language parsing and semantic understanding by computer systems. Review of formal, context-free, and transformational grammars and parsing. Augmented transition networks problems of complexity, semantics, and context. Deterministic parsing Marcus nontracking systems and ungrammatical input. Semantic parsing. semantic nets and scripts. Prerequisite: CSci 224, 232. (Spring—evening) (Bock)

324 **Knowledge-Based Systems** (3)
The design, structure, and application of expert systems in artificial intelligence. Knowledge representation, data bases, inference engines, rule sets, and user interfaces. Specific tools used to build expert systems, including semantic networks, frame systems, and deduction–inferencing mechanisms. Applications of expert systems, including consultation, CAI support, circuit analysis, intelligent front ends, and planning systems. Examination of case studies, including EMYCIN, SACON, PROSPECTOR, TERESIAS, GUIDON, and SOPHIE. Prerequisite: CSci 224. (Fall) (Bock)

327 **Advanced Topics in Information Systems** (3)
Special topics, such as architecture of information systems, organization of large dynamic files, multidimensional search, user interfaces, and database machines. Students are encouraged to present reports in information systems research. Prerequisite: CSci 159 and one course chosen from CSci 215, 216, or 226; or permission of course director. (Fall, odd years—evening) (Berkovich)

337 **VLSI Systems Organization and Applications** (3)
Impact of VLSI on the philosophy of computer systems design. Computational models for concurrent processing. Concept of cellular automaton. Data flow. Processor arrays. Associative processing. Computer communications. Redundancy and reliability. Fault tolerance. Parallel algorithms and organization of highly concurrent computations for large-scale problems. Specialized applications of VLSI systems. Prerequisite: CSci 237, EE 214. (Fall, even years) (Berkovich)

356 **Seminar in Programming Design and Implementation** (3)
Topics may include the following. Approaches to programming language design. Models and methodologies. Top-down and bottom-up parsing techniques. Code optimization techniques. Compilation techniques for special language features, such as parallel processing, coroutines, abstract data types, and nonprocedural languages. Incremental compilers and programming environments. Portability issues, translator writing systems. Prerequisites: CSci 256, 258. (Fall—evening, alternate odd years)

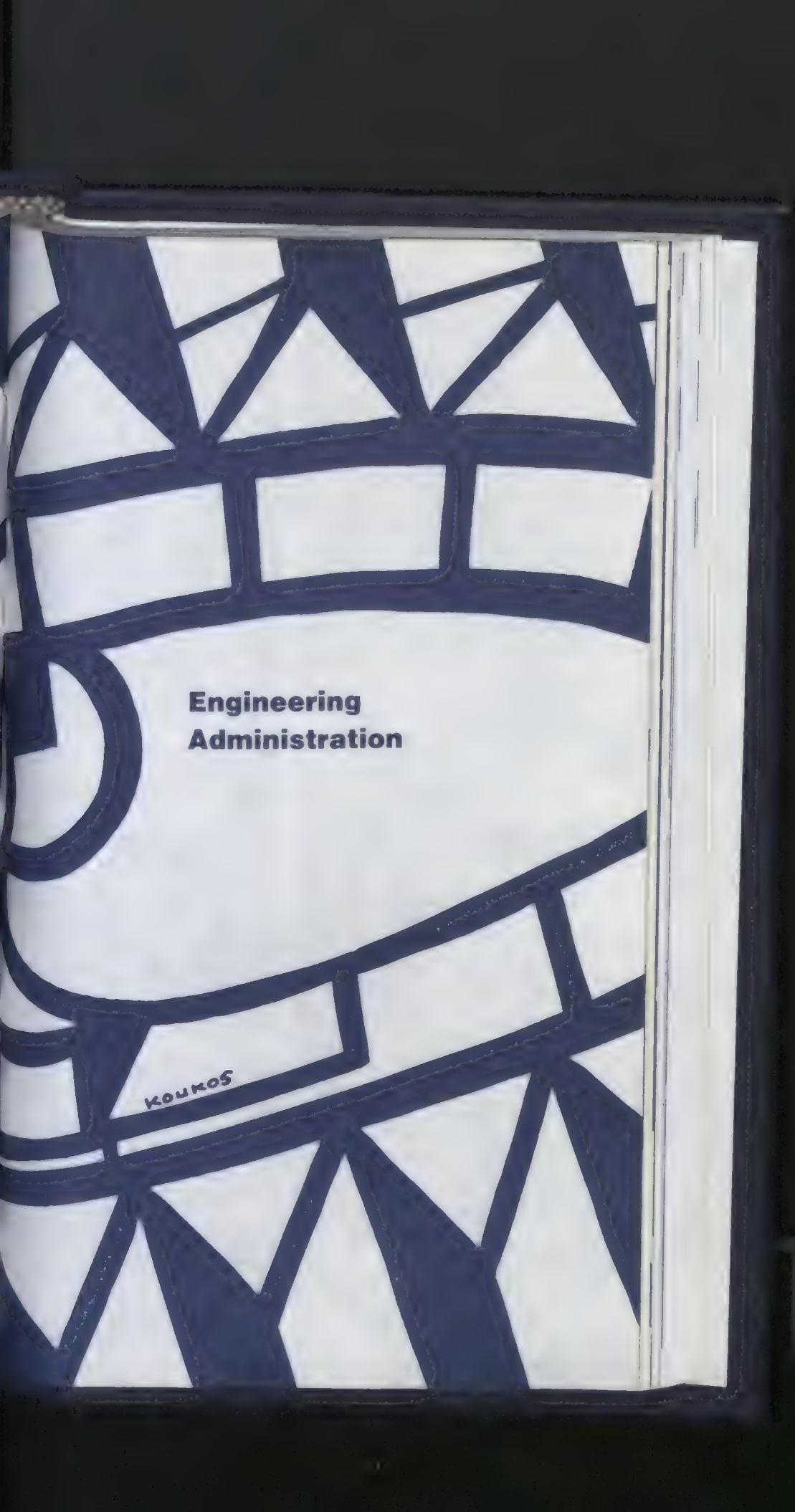
358 **Concurrency and Parallelism in Programming Languages** (3)
Models as embodied in current and experimental programming languages for the support of concurrency and parallelism. Recent work by Ichbiah, Dijkstra, Hoare, Brinch–Hansen, Liskov, and others. Tasks and rendezvous, semaphores, synchronization, monitors, and message passing. Language support for distributed processing. Languages considered include Ada, Concurrent Pascal, Modula-2, and CSP. Student projects incorporate hands-on experience where feasible; emphasis on comparison of alternative strategies. Research paper required. Prerequisite: CSci 258 or permission of instructor. (Spring, even years) (Feldman)

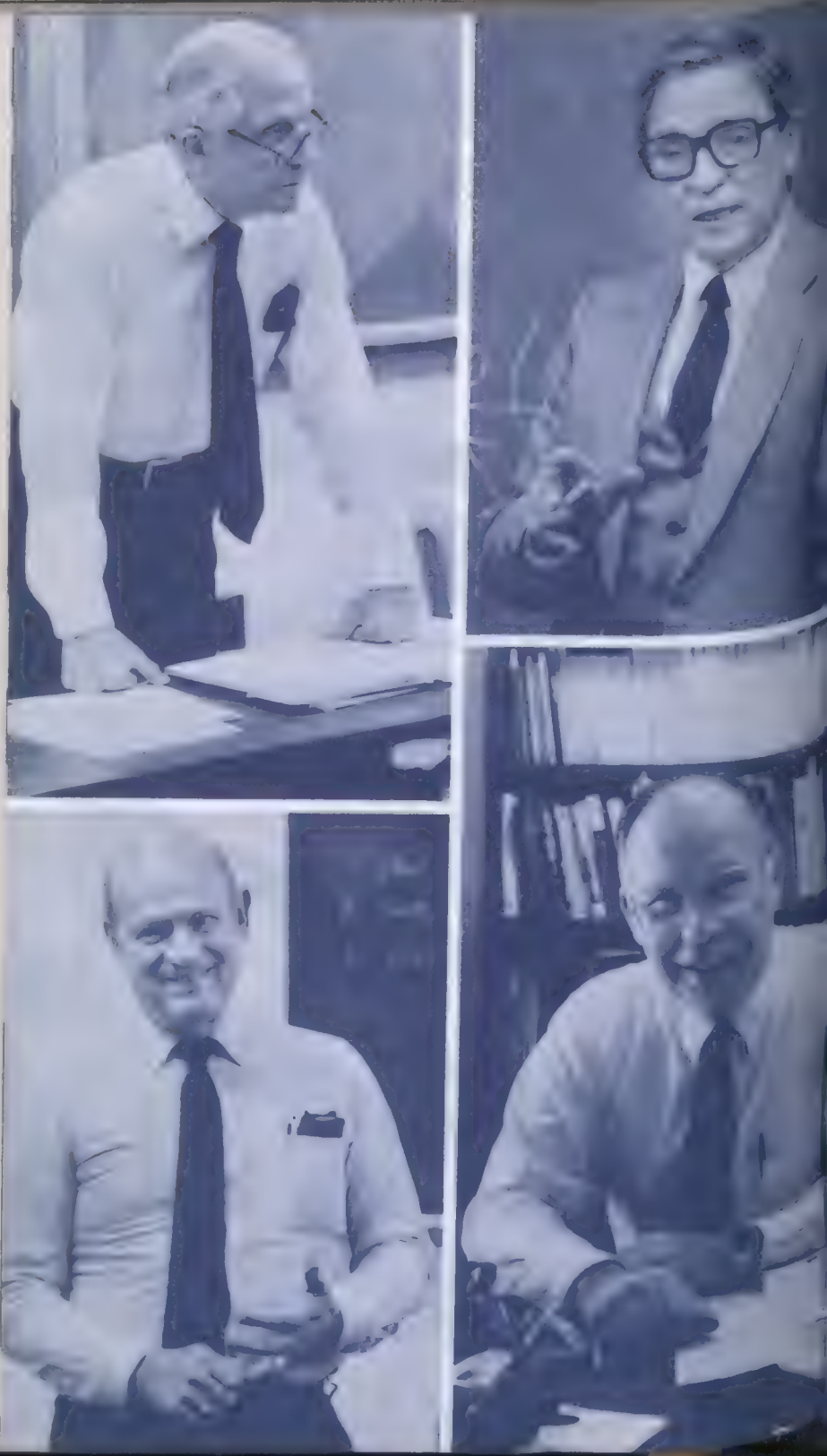
390 **Colloquium** (0)
Lectures by outstanding authorities in electrical engineering and computer science. Topics to be announced each semester. (Fall and Spring) (Lang)

391 **Computer Science Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)




Engineering
Administration
KOUKOS





# Engineering Administration

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***Assistant Professorial Lecturers*** J.D. Liveris, R.B. Davis, M.R. Habib, A.A. Moghadam, R.D. Hofler, P.G. Meikle, F. Suber, Jr., T.P. Henry, L.F. Jackson, S.M. Janssen, R.W. Witzel
***Lecturer*** A.R. Murray

Programs in the Department of Engineering Administration lead to the Master of Engineering Administration, Master of Science, professional, and Doctor of Science degrees. The department offers both a general program in engineering administration and specialized programs in administration of research and development, artificial intelligence and human factors, construction management, environmental and energy management, information systems management, marketing of technology, systems analysis and management, technology and public affairs, public works management, and transportation management.

## Master of Engineering Administration Degree Program

The program leading to the Master of Engineering Administration prepares students with undergraduate degrees in engineering, natural science, or mathematics for managerial positions in technological and scientific organizations in industry, government, and the armed services.

The program consists of a minimum of 24 semester hours of approved graduate courses and a master's thesis (equivalent to 6 semester hours), or at least 33 semester hours of approved course work without a thesis.

The program is designed to give students a broad understanding of the administrative process and help them to develop managerial skills in the functional areas of engineering administration. Although years of experience are required to develop the ability, insight, and mature judgment that distinguish an effective manager, a graduate professional management curriculum can give the student an excellent start. One of the program's main objectives is to help the student learn to examine problems from the managerial point of view. By integrating past experience with graduate study, each student develops a personal frame of reference for managing technological and scientific organizations.

The management of technological organizations is one of the greatest challenges of our times. The professional engineering manager today must

understand both the technologies being developed and the rapidly changing marketplace in which these technologies will be applied. The engineering administrator is the link between these dynamic technologies and the needs of society. Therefore, the program in engineering administration provides an opportunity for students to both enhance their technical knowledge and sharpen their administrative skills.

## Admission Requirements

An applicant for the Master of Engineering Administration program must have an undergraduate degree in engineering, natural science, or mathematics. In addition to the requirements for admission to graduate study in the School, applicants for programs leading to the degree of Master of Engineering Administration must meet the following requirements: (1) The applicant must have basic knowledge of calculus, the principles of management, engineering economic analysis, and quantitative methods. These requirements, except for calculus, can be met by satisfactory completion of EAd 150, 160, and 170 or approved equivalents. (2) The applicant may be required to complete other undergraduate prerequisite courses with a grade of *C* or better (in some cases, a grade of *B* or better may be stipulated). If this scholarship requirement is not met, the student is barred from further enrollment. Credit for prerequisite courses is not applicable toward the master's degree and, unless approved by the department chair, all prerequisite courses must be completed before the student registers for graduate courses.

A student must be accepted in a graduate program to receive credit for any graduate courses taken to satisfy degree requirements.

## Master's Comprehensive Examination

All students must pass the Master's Comprehensive Examination, which is given twice a year. On the prescribed form and prior to the deadline, students must notify the department of their intent to take the examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused absence constitutes a forfeiture and is regarded as a failure of the examination.

The examination lasts four hours. It is designed to demonstrate the student's ability to integrate material from several course areas and apply what has been learned. The examination is drawn from prerequisite and core courses; however, answers should be supplemented by information from other courses.

The comprehensive examination may be taken any time after completion of the core courses. With faculty approval, a student who fails the Master's Comprehensive Examination may be reexamined. If the student fails the examination on the second attempt, the student's graduate status is terminated.

## Core Courses

The following courses are required for the Master of Engineering Administration degree and must be taken prior to any other courses in the program:

EAd 211–12: Engineering Administration (3–3)
EAd 269: Elements of Decision Making and Problem Solving (3)

## General Program in Engineering Administration

The general program in engineering administration provides the background managers need to confront the increasing complexities of science and technology. Technical knowledge is complemented by understanding of management theory and practice as applied to the administration of engineering and science. The program emphasizes study of general administrative problems and opportunities as well as the use of specific knowledge and methods to solve problems and explore opportunities. Each student designs a program of study in consultation with the adviser. The program must include the following:

EAd core courses (9)
EAd 299–300: Thesis Research (6) *or* EAd 297: Problems in Engineering Administration (3) (nonthesis option)
Electives (15–21): Chosen from the Department of Engineering Administration and other departments of the University, with no more than two courses selected from other departments

## Areas of Concentration

Students who wish to pursue a specific area of concentration, rather than follow the general program in engineering administration, may select one of the programs described below.

### *Administration of Research and Development*

The program prepares students for managerial positions in organizations that conduct, plan, or administer programs of technological or scientific research and development. The program of study designed by each student in consultation with the adviser must include the following:

EAd core courses (9)
EAd 207: The Personnel Function for Engineering Administrators (3)
EAd 255: Administration of Research and Development (3)
EAd 299–300: Thesis Research (6) *or* EAd 297: Problems in Engineering Administration (3) (nonthesis option)
Electives (9–15)

### *Construction Management*

This program encompasses all levels of construction management: in the field, in the project office, and in the main office. It covers such areas as basic planning, design, and construction methods; problems of contracts and specifications; techniques of scheduling and control; and labor relations and industrial psychology. The program of study designed by each student in consultation with the adviser must include the following:

EAd core courses (9)
EAd 241: Construction Management I (3)
EAd 242: Construction Management II (3)
EAd 261: Economic Analysis in Engineering Planning (3)
EAd 299–300: Thesis Research (6) *or* EAd 297: Problems in Engineering Administration (3) (nonthesis option)
Electives (6–12)

### *Environmental and Energy Management*

This program prepares students for positions in organizations concerned with environmental, energy, and related resource management, including programs in environmental control and energy conservation, energy resource development and use, and prevention and control of environmental pollution. The program of study designed by each student in consultation with the adviser must include the following:

EAd core courses (9)
EAd 221: Environmental Management (3)
EAd 222: Energy Management (3)
EAd 261: Economic Analysis in Engineering Planning (3)
EAd 299–300: Thesis Research (6) *or* EAd 297: Problems in Engineering Administration (3) (nonthesis option)
Electives (6–12)

### *Marketing of Technology*

This program prepares students to market technical products and services internationally. The program of study designed by each student in consultation with the adviser must include the following:

EAd core courses (9)
EAd 293: Technical Enterprises (3)
EAd 294: Marketing of Technology I (3)
EAd 299–300: Thesis Research (6) *or* EAd 297: Problems in Engineering Administration (3) (nonthesis option)
EAd 311: Marketing of Technology II (3)
Electives (6–12)

### *Public Works Management*

The public works sector is one of the largest and most diverse fields of public service. The program in public works management is designed to help students apply pertinent knowledge to the field and develop sensitivity to the people-related technical problems that confront the public works professional. The program of study designed by each student in consultation with the adviser must include the following:

EAd core courses (9)
EAd 215: Ethical Issues in Engineering Administration (3)
PAd 231: Personnel Management (3)
PAd 242: Administration of State and Local Governments (3)
EAd 297: Problems in Engineering Administration (3) *or* PAd 290: Special Topics in Public Administration (3)
Electives (6): Chosen from engineering administration
Electives (6): Chosen from public administration and/or civil engineering

### *Technology and Public Affairs*

This program prepares students for decision-making positions concerned with the impact of technology on public policy and the interrelationship between modern technology and public affairs. The program of study designed by each student in consultation with the adviser must include the following:

EAd core courses (9)
EAd 261: Economic Analysis in Engineering Planning (3)
EAd 288: Technology Issue Analysis (3)
EAd 299–300: Thesis Research (6) *or* EAd 297: Problems in Engineering Administration (3) (nonthesis option)
EAd 386: Advanced Topics in Management (3)
Electives (6–12)

### *Transportation Management*

This program prepares students to manage transportation systems or formulate transportation policy. The program of study designed by each student in consultation with the adviser must include the following:

EAd core courses (9)
EAd 261: Economic Analysis in Engineering Planning (3)
EAd 265: Transportation Management I (3)
EAd 266: Transportation Management II (3)
EAd 299–300: Thesis Research (6) *or* EAd 297: Problems in Engineering Administration (3) (nonthesis option)
Electives (6–12)

## Master of Science Degree Program

The Department of Engineering Administration also offers several opportunities for interdisciplinary study leading to the Master of Science degree. The program consists of a minimum of 24 semester hours of approved graduate courses and a master's thesis (equivalent to 6 semester hours), or at least 33 semester hours of approved course work without a thesis. In addition to the core courses in engineering administration listed below, each student must select an area of concentration. The student is assigned an adviser in the area of concentration with whom a program of study is developed.

### Admission Requirements

In addition to the requirements for admission to graduate study in the School, applicants for the program leading to the Master of Science degree must have a basic knowledge of calculus, probability and statistics, principles of management, and engineering economic analysis. This requirement can be met by satisfactory completion of the following undergraduate courses or approved equivalents: Math 51 and 52, Mathematics for the Social and Management Sciences I and II; EAd 150, Introduction to Engineering Administration; EAd 160, Introduction to Engineering Economic Analysis; and EAd 170, Basic Quantitative Methods for Engineering Administration. A student must earn a grade of *C* or better in each undergraduate prerequisite course, and in some cases a grade of *B* or better may be stipulated. If this scholarship requirement is not met, the student is barred from further enrollment. Credit for prerequisite courses is not applicable toward the master's degree and, unless approved by the department chair, all prerequisite courses must be completed before the student registers for graduate courses.

### Master's Comprehensive Examination

All students must pass the Master's Comprehensive Examination, which is given twice a year. On the prescribed form and prior to the deadline, students

must notify the department of their intent to take the examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused absence constitutes a forfeiture and is regarded as a failure of the examination.

The examination lasts four hours. It is designed to demonstrate the student's ability to integrate material from several course areas and apply what has been learned. The examination is drawn from prerequisite and core courses; however, answers should be supplemented by information from other courses.

The comprehensive examination may be taken any time after completion of the core courses. With faculty approval, a student who fails the Master's Comprehensive Examination may be reexamined. If the student fails the examination on the second attempt, the student's graduate status is terminated.

## Core Courses

The following courses are required for the Master of Science degree and should be taken prior to any other courses in the program:

EAd 211–12: Engineering Administration (3–3)
EAd 269: Elements of Decision Making and Problem Solving (3)
[In the systems analysis and management concentration, OR 201 is substituted for EAd 269.]

## Areas of Concentration

Students should select one of the following areas of concentration.

### *Artificial Intelligence and Human Factors*

This concentration takes a cognitive approach to artificial intelligence, with emphasis on how humans think and how the brain works. It examines the means by which a researcher can determine users' support system needs, subject-to-user cognitive needs and styles, task requirements, and optimum organizational environments. Students learn how to apply existing AI packages and, more important, how to develop appropriate packages in response to new demands. Course work in the concentration provides hands-on experience in translating human cognitive behavior into machine intelligence. Students are encouraged to choose electives that complement this approach.

The program of study designed by each student in consultation with the adviser must include the following:

EAd core courses (9)
EAd 217: Fundamentals of Artificial Intelligence (3)
EAd 270: Comparative Expert Systems (3)
EAd 287: Decision Support Systems and Models (3)
EAd 290: Human Factors Engineering (3)
EAd 299–300: Thesis Research (6) *or* EAd 297: Problems in Engineering Administration (3) (nonthesis option)
Electives (3–9)

### *Information Management*

Information has become a major resource of modern organizations. The design and operation of efficient information management systems requires knowl-

edge of both the management process and computer technology. This program offers interdisciplinary study in engineering administration, management science, and computer science. It provides insight into the problems of management, understanding of the viewpoints and techniques of managers, and an appreciation of the technology of data processing and data communications. Two areas of specialization are offered: software systems and applications of information systems.

Only a nonthesis option is offered in this concentration. The program of study designed by each student in consultation with the adviser must include the following:

EAd core courses (9)
EAd 251: Management of Information Resources (3)
EAd 297: Problems in Engineering Administration (3)

The student must also complete the required courses in one of the areas of specialization, as listed below.

***Software Systems***

*CSci 147: Assembly Language Programming I (3)
*or*
*CSci 157: Assembly Language Programming II (3)
*CSci 158: Algorithmic Methods (3)
CSci 159: Programming and Data Structures (3)
CSci 227: Management Information Systems and Database Management (3)

***Applications of Information Systems***

EAd 254: Computer Systems in Information Management (3)
EAd 256: Survey of Information Systems (3)
EAd 295: Management of Technical Information and Databases (3)
EAd 321: Management of Information Systems and Networks (3)

Additional courses are selected, with permission of the faculty adviser, to total 33 credit hours.

## *Systems Analysis and Management*

The systems viewpoint has proven useful in designing organizations and detecting, analyzing, and solving organizational problems. It emphasizes the interconnectedness of elements and activities of a system, including personnel considerations. There is increasing demand for individuals who can apply this approach to organizational systems.

Analysis and management of organizations from the systems standpoint requires study in both management and operations research. Such study should provide insight into organizations and their personnel, understanding of the viewpoints and techniques of managers with whom the systems analyst or manager must interact, mathematical and statistical tools for analyzing and synthesizing systems, and scientifically based methods for detecting and solving system problems. In addition, the increasing application of computers for management makes understanding of their capabilities essential.

* Students who have training or experience in assembly language programming may take CSci 201 in place of CSci 147 (or CSci 157) and CSci 158.

Only a nonthesis option is offered in this concentration. The program of study designed by each student in consultation with the adviser must include the following:

EAd core courses, excluding EAd 269 (6)
EAd 281: Systems Analysis and Management I (3)
EAd 282: Systems Analysis and Management II (3)
EAd 287: Decision Support Systems and Models (3)
OR 201: Survey of Operations Research: Deterministic Models (3)
OR 202: Survey of Operations Research: Stochastic Models (3)
OR 235: Systems Modeling for Management and Policy I (3)
EAd 297: Problems in Engineering Administration (3) *or* OR 291: Problems in Operations Research (3)
Electives: Two courses chosen with adviser's approval, normally from offerings of the Department of Operations Research

## Professional Degree Program

The professional degree program provides graduate study beyond the master's degree in the following areas:

Administration of Research and Development
Artificial Intelligence and Human Factors
Construction Management
Engineering Administration
Environmental and Energy Management
Information Management
Marketing of Technology
Public Works Management
Systems Analysis and Management
Technology and Public Affairs
Transportation Management

### Admission Requirements

Admission to study toward the professional degree requires appropriate bachelor's and master's degrees from recognized institutions and evidence of capacity for productive study. To study toward the professional degree of Engineer, an applicant must have a bachelor's degree in engineering; for the professional degree of Applied Scientist, an applicant must have a bachelor's degree in mathematics or a natural science. In both cases, applicants must have a master's degree in engineering administration or a related field, with a grade-point average of at least 3.2 (on a 4.0 scale) in course work leading to the degree. Applicants who have equivalent backgrounds may be considered.

Applicants with master's degrees in engineering, natural science, or mathematics may be required to complete the three core courses (EAd 211–12, 269) and at least one elective, selected with approval of the student's adviser, with a grade of *B* or better.

### Degree Candidacy

An applicant is admitted to candidacy for the degree after satisfactorily meeting all prerequisites. No courses taken by the applicant to make up deficiencies can be applied toward the professional degree. If course work beyond the prerequisites is taken before admission to degree candidacy, a

maximum of 9 hours of this course work can, with the approval of the adviser, be applied toward degree requirements.

## Program of Study

Upon admission to the professional degree program, the student is assigned a faculty adviser. Together they formulate a program of study for the student that must include a minimum of 30 semester hours of course work beyond the master's degree, of which 6 are devoted to completion of a professional project. Students whose prior study does not include specified prerequisites may be required to take additional courses. The program of study must be approved by the student's adviser and the department chair.

As part of the program of study, the student selects an area of concentration to prepare for work on the professional project. Additional courses are chosen to support work on the planned project or meet other needs. With prior approval of the adviser, up to 12 semester hours may be taken in other University departments if such work is pertinent to the program. (These 12 hours include any transfer credit.)

## Professional Project

Each degree candidate must submit an acceptable report of a professional project involving the analysis and solution of an actual problem in engineering administration. The project should demonstrate the student's ability to apply newly acquired knowledge, to identify a problem, to work out a solution, and to communicate the results in writing.

When all other course work is essentially completed and with the adviser's approval, the candidate registers for EAd 395–96, Seminar: Professional Project, to receive guidance in the professional project. Before registering for this course, the candidate should identify a project or area of study and prepare a written proposal that includes consideration of the project's feasibility. After registering for EAd 395–96, the candidate must submit a detailed project proposal to the project adviser and the department chair for approval. Six semester hours are assigned for work on the professional project.

## Scholarship

If a student studying for the professional degree receives more than two course grades below *B* or more than one *F*, study is terminated and further enrollment prohibited. A student must achieve a final quality-point average of at least 3.1 to receive the degree.

# Doctor of Science Degree Program

## Admission Requirements

All applicants must meet the general requirements for admission to doctoral study in the School of Engineering and Applied Science. In addition, the applicant must have a master's degree in engineering administration or a related field, with a record of superior academic achievement (a grade-point average of at least 3.4 on a 4.0 scale). Applicants with master's degrees in engineering, natural science, or mathematics may be required to complete the

three core courses (EAd 211–12, 269) and at least one elective, selected with approval of the student's adviser, with a grade of *B* or better.

An applicant is admitted to candidacy for the degree after satisfactorily meeting all prerequisites and completing all course and language requirements and qualifying examinations. No courses taken by the student to make up deficiencies can be applied toward the doctoral degree. If course work beyond the prerequisites is taken before admission to the degree program, a maximum of 9 hours of this course work can, with the approval of the adviser, be applied toward degree requirements.

## Language Requirement

A reading knowledge of one foreign language must be demonstrated before the qualifying examination may be taken. The student must obtain the adviser's approval of the language selected.

For doctoral students whose native language is not English, English will be designated as the language to satisfy the student's foreign language requirement. Before taking the qualifying examination, the student must pass an examination in English administered for doctoral candidates in the Department of Engineering Administration by the English for International Students program.

## Program of Study

The program of study will consist of a major and a minor area of concentration, which may be chosen from the areas administered by this department or from appropriate areas available in other departments of the University.

Upon admission to the doctoral program, the student is assigned a faculty adviser. Together they formulate a program of study by which the student will make up any deficiencies, prepare for the qualifying examination, and meet degree requirements. An area of study is selected to prepare the student to undertake dissertation research. Additional courses are chosen to support work on the dissertation or meet other needs. The program of study must be approved by the student's adviser and the department chair.

## Doctoral Qualifying Examination

After completing all course work and fulfilling the language requirement, doctoral candidates in the Department of Engineering Administration must be examined in their major and minor areas of concentration. A typical qualifying examination, covering both fields, extends over four or five days. The examinations are offered twice a year, in the fall and spring semesters, and students must take the major and the minor field examinations in the same semester. The candidate's adviser should notify the department chair of the student's intention to take the qualifying examination before the end of the first month of the semester in which the student wishes to be examined.

## Dissertation

After passing the qualifying examination, the candidate identifies a project or area of study and prepares a detailed proposal that includes consideration of the merit of the planned research and the adequacy of his or her preparation to conduct it successfully. The proposal is submitted for approval to a selected

faculty member, who will serve as the student's director of research, and two additional members of the department who will constitute the proposal committee. Work on the research project is conducted as part of the dissertation course, EAd 399.

### Scholarship

A student must have a cumulative quality-point index of at least 3.4 to receive the doctoral degree. If a student receives more than two course grades below *B* or more than one *F*, study is terminated and further enrollment prohibited.

### Time Limits

A full-time student in the doctoral program is allowed a maximum of five calendar years to complete all degree requirements, from the date of first registration as a degree candidate in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of seven calendar years. The time limit does not include any period of registration as an unclassified student before admission to degree candidate status or any period spent on approved leave of absence.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to degree candidate status under conditions specified by the department chair.

## Special Facilities

### Artificial Intelligence Laboratory

This research-grade laboratory may be used by students enrolled in EAd 270 and, as available, by those conducting thesis or dissertation research. The laboratory consists of a number of single-user LISP machines connected via a local area network (Ethernet). Each LISP machine is a state-of-the-art minicomputer with a wide range of programmer "workbench" intelligent aids. Most major expert-system packages are in use at the AI laboratory, and a substantial library of expert-system construction kits has been granted to the laboratory by producers such as IntelliCorp (KEE™), Teknowledge (S.1™), and Xerox AI Systems. The INNOVATOR expert-system generator kit was created at the AI laboratory.

### Decision Support Systems Laboratory

A computer laboratory is provided for the primary use of engineering administration and operations research students. This laboratory is intended to give hands-on experience in the use of computers as a management tool and provides microcomputers and user-friendly management software programs. When additional computing power is needed, however, the microcomputers can be used as reactive terminals with minicomputers in the School of Engineering and Applied Science and with the University's mainframe computer processing unit. The laboratory is also used for research on decision support systems for management and computer-aided teaching in management education.

## Human Factors Laboratory

The human factors laboratory provides a setting for interdisciplinary research in the area of human–system interaction, with emphasis on the design of human–computer interfaces. Current research projects include investigations of human supervisory control of computer-aided manufacturing systems, cognitive aspects of software design, expert–novice differences in problem solving, human factors in hospital critical care units, and the comparative effectiveness of two- and three-dimensional presentations of graphical information. The laboratory is equipped with IBM computers, statistical packages, graphics software, and various psychometric tests.

# Engineering Administration Undergraduate Courses

150 **Introduction to Engineering Administration** (3)
Interrelationships of engineering, science, and management; interaction among individuals and groups in the engineering environment. Typical activities of engineering managers, motivations of engineers, engineers as managers. Social and organizational factors relevant to the management of engineers. This course is preliminary to study of the complete management process in EAd 211–12. (Fall, Spring, and Summer)

160 **Introduction to Engineering Economic Analysis** (3)
Economic decisions, equivalence, mathematics of finance, present worth, annual cost or profit, internal rate of return, cost–benefit ratio, incremental analysis, multiple alternatives, economic decisions under risk, inflation, depreciation methods, balance sheets, profit and loss statements, the accountant's view, and before- and after-tax analysis.
(Fall, Spring, and Summer)

170 **Basic Quantitative Methods for Engineering Administration** (3)
Introductory treatment of quantitative tools and techniques important in engineering administration. Concepts of probability, statistics, and operations research. (Fall, Spring, and Summer)

# Engineering Administration Graduate Courses

204 **Administration of Engineering Contracts** (3)
Study of the total contracting process (including initial budget preparation and justification, execution of a contract, and administration of the contract to completion) considered from the viewpoints of the industrial and government buyer and the seller of technical materials and services.
(Fall and Spring)

207 **The Personnel Function for Engineering Administrators** (3)
Principles, theory, and practical considerations of the personnel function for engineering managers, with applications for engineering administration.
(Fall)

210 **Engineering Law** (3)
Legal principles and procedures of interest to engineers. The American legal system, contracts and specifications, liability of professional engineers, product liability, agency relationships, patent and proprietary rights, special problems in research-and-development contracts. (Fall and Spring)

211–12 **Engineering Administration** (3–3)
Comprehensive and systematic study of the administrative process in industrial, scientific, and engineering environments. Planning: objectives, prediction, policies, characteristics of plans. Organizing: theory of organization, structure, authority, specialization, delegation, staff, committees. Directing:

leadership, managing human and material resources. Controlling: setting standards, evaluating performance, using system feedback data for correction and improvement. Prerequisite: EAd 150, 160, or equivalent. (Fall, Spring, and Summer)

215 **Ethical Issues in Engineering Administration** (3)
Moral philosophy from which ethics are derived; ethical issues and problems encountered in the administration of engineering and related areas. Use of case study method to enhance student's ability to recognize ethical aspects of situations and to think analytically and synthetically about such aspects. (Spring)

217 **Fundamentals of Artificial Intelligence** (3)
History of AI, knowledge representation, search and control techniques, natural language processing, computer vision, computer speech, robotics, expert systems, evidential reasoning, AI machines, and features of the LISP and PROLOG languages. Hands-on experience with LISP, a robot arm, a natural language system, and an intelligent database interfacer. (Spring)

221 **Environmental Management** (3)
Technical, economic, political, administrative, and social forces influencing the quality of the environment and the use of resources. Review of government and industrial programs to combat pollution of the air, land, and water. Review of existing and pending legislation involving environmental and related energy matters, theoretical aspects of specific management problems, tools for assessing environmental impact, institutional designs, procedures for promoting public participation. (Fall)

222 **Energy Management** (3)
Conservation and management of the supply of and demand for energy resources, including petroleum, natural gas, coal, nuclear power, and unconventional forms. Topics include energy legislation; theoretical aspects of pricing and scarcity doctrine; instruments for energy policy; hard, soft, and balanced energy paths; social, legal, and institutional barriers to new technologies in extraction, processing, and utilization. Attention is given to combating scarcity, using methods that have the least cost and environmental impact. (Spring)

231 **Program Management** (3)
Management science, the systems approach, and traditional managerial concepts applied to a variety of typical cases, such as technical programs and projects in government and industry. (Spring)

241 **Construction Management I** (3)
Types of construction procurement, aspects of contracts and specifications important to project management, subcontracting, project income, insurance, bonds, mechanics' liens. (Fall and Spring)

242 **Construction Management II** (3)
Administration of construction projects: planning, scheduling, control, resource allocation, and least-cost expediting (CPM and PERT techniques). Labor relations, project safety (OSHA). (Fall and Spring)

243 **Construction Management III** (3)
Application of quantitative models to construction management problems using microcomputers. Decision and risk analysis, applied probability concepts, bidding theory and practice, simulation of the construction process, queuing models, dynamic programming. Formulation and solution of quantitative models through the use of case studies. Integrated use of the microcomputer, including database creation and management and spreadsheet programs. (Fall and Spring)

245 **Maintenance Management** (3)
Maintenance functions and the role of the technical manager in designing, supervising, and implementing maintenance programs. Topics include human aspects of maintenance, preventive maintenance, and computers in maintenance. Prerequisite: EAd 211, 212, 269. (Fall)

251 **Management of Information Resources** (3)
Introduction to analysis, design, and implementation of on-line management information systems, including feasibility studies, requirements analysis, specifications, hardware and software considerations, performance evaluation, implementation plans, and postmortem considerations. Elements of information-processing technology, including data transmission and computer networking. Consideration of time sharing, facilities management, stand-alone computers, service bureaus, centralization versus decentralization, with emphasis on the use of micro- and minicomputers in distributed processing. Prerequisite: EAd 254 or permission of instructor. (Fall and Spring)

253 **Production Management** (3)
Consideration of production operations in the context of an integrated company strategy. Process and trade-off analyses, capacity management and planning, technology planning. (Spring)

254 **Computer Systems in Information Management** (3)
Use of computers in information systems, with emphasis on accounting applications. Introduction to microcomputer analytical tools, logic of computers, hardware and software concepts, and data communications. Laboratory required. (Fall, Spring, and Summer)

255 **Administration of Research and Development** (3)
Study of technological innovation as a vital part of the organizational adaptation process. Role of the technical manager in using organization, planning, and motivation to accomplish research and development objectives. (Fall)

256 **Survey of Information Systems** (3)
Information systems that provide support for management in areas such as finances, manufacturing, and marketing. Introduction to analysis of data flow, databases, and data communications. Laboratory required. Prerequisite: EAd 254 or permission of instructor. (Fall and Spring)

261 **Economic Analysis in Engineering Planning** (3)
Case studies in engineering economic planning, advanced problems in engineering economy. Prerequisite: EAd 160 or an equivalent course in engineering economy, EAd 269 or permission of instructor. (Fall and Spring)

262 **Finance for Engineers** (3)
Financial concepts encountered in engineering situations: financial statements, costing, inventories, profitability analysis, depreciation, credit, leasing, capital formation. (Fall)

265 **Transportation Management I** (3)
Integration of social, technical, economic, and political considerations that shape transportation systems and their management. Focus on modal histories and relative advantages. (Fall)

266 **Transportation Management II** (3)
Investigation of the economics and management of the airline industry from the U.S. and international perspectives. Topics include impact of deregulation and politics on the provision of air transportation. (Spring)

269 **Elements of Decision Making and Problem Solving** (3)
Concepts and quantitative techniques of the scientific method used in solving administrative problems. Role of decision criteria and subjective factors. Bayesian analysis. Value of information. Mathematical programming: linear, integer, and dynamic. Introduction to queuing theory. Forecasting. Quality control: control charts and acceptance sampling. Prerequisite: EAd 170 or equivalent. (Fall, Spring, and Summer)

270 **Cooperating Expert Systems** (3)
Human use of intuitional heuristics, parallel reasoning, and holistic analogies considered from a cognitive point of view. Students attempt to model expert human behavior and emulate it in a LISP-machine environment. Includes hands-on experience with expert-system tools, paradigms, and

languages and a class project involving a distributed blackboard expert system. (Fall and Spring)

281 **Systems Analysis and Management I** (3)
The systems or holistic approach as a methodology for making decisions and allocating resources. Analysis by means of objectives, alternatives, models, criteria, and feedback. Prerequisite: EAd 269 or equivalent. (Fall)

282 **Systems Analysis and Management II** (3)
Case studies in systems analysis, including applications to industrial, economic, and military situations. Prerequisite: EAd 281 or permission of instructor. (Spring)

285 **Seminar: Administrative Problems** (3)
Individual analysis of complex administrative problems, with group evaluation and discussion. Prerequisite: 18 semester hours of graduate credit. (Fall and Spring)

287 **Decision Support Systems and Models** (3)
Intended to expose managers to decision tools and the modeling process, and modelers and system designers to the decision maker's perspective. Impact of human behavioral, managerial, and situational factors on choice of computer-based technique; simplified models. Review of theory, languages, and methods in system modeling and artificial intelligence. Management of the modeling process, including predesign, software costing (make or buy), development, verification, validation, and implementation cycles. Case studies. Prerequisite: EAd 254 or permission of instructor. (Fall and Spring)

288 **Technology Issue Analysis** (3)
Contextual background and intellectual basis for addressing technology issues in the public and private sectors. Technology impact assessment, forecasting, innovation, and the principles and practices of technology transfer as elements of a systematic approach to making technology decisions. (Fall)

290 **Human Factors Engineering** (3)
Identifying human needs and human factors of common human–machine interfaces, such as computerized systems, command and control systems, and instrument panels. Theoretical underpinnings of human factors and cognition; human reliability as information processors. Methodologies for measuring and designing machine interfaces from the human factors viewpoint, case studies of successful human–machine interfaces, job design and technological change. Hands-on experience in designing and evaluating interfaces. (Fall)

293 **Technical Enterprises** (3)
Essential features of technology-based companies from the entrepreneur's point of view. Team management of an enterprise in a computer-simulated environment. Designed for those working in technical firms and for government personnel who depend on technical firms as suppliers. (Fall)

294 **Marketing of Technology I** (3)
Marketing industrial goods and high-technology projects, with special attention to the federal government as a market. Products, channels, pricing, promotion, and personal selling as elements of strategy. (Spring)

295 **Management of Technical Information and Databases** (3)
Logical and physical structures of databases: record structures, transaction processing, access methods, inverted files. Traditional storage techniques, database management systems, relational databases, databases for computer-aided engineering. Laboratory required. Prerequisite: EAd 254 or permission of instructor. (Fall and Spring)

297 **Problems in Engineering Administration** (3)
Project course providing the opportunity to apply concepts and tools previously studied to the solution of a problem in engineering administration. Students work individually or in small groups, each on a problem proposed by the student and approved by the instructor. (Fall, Spring, and Summer)

298 **Research** (arr.)
Basic or applied research in engineering administration or systems analysis. Open to master's degree candidates in the department. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

311 **Marketing of Technology II** (3)
Special attention to marketing research, negotiation, and international marketing. Required for master's degree candidates in the marketing of technology program. Prerequisite: EAd 294 or permission of instructor. (Fall, even years)

321 **Management Information Systems and Networks** (3)
Advanced course in management information systems (MIS) with emphasis on technologies for making computer/communication networks a reality. Traditional methodologies used in the development of MIS, introduction of computer/communication networks and distributed data processing, and the resulting impact and trends in the development of MIS within organizations. Prerequisite: EAd 254 or permission of instructor. (Fall and Spring)

344 **Construction Management IV** (3)
Construction methods and machinery. Examination of equipment available for construction, economics of equipment ownership, selection and management of optimum equipment for projects. Use of microcomputers for equipment simulation. (Fall and Spring)

386 **Advanced Topics in Management** (3)
Reading and discussion of classical and recent literature concerning the philosophy and application of management principles. (Fall, odd years)

387 **Technological Forecasting** (3)
Concepts and methodology: normative and exploratory forecasting, resource allocation and forecasting, technology transfer, technological change and its effects on forecasting, technology assessment. (Spring, even years)

388 **Cost Effectiveness** (3)
Concepts of evaluation of engineered systems, current methods and trends in methodology, system resource requirements, probability and decision theory in cost-effectiveness studies, systems approach to cost-effectiveness studies. Prerequisite: EAd 160 or equivalent. (Spring, even years)

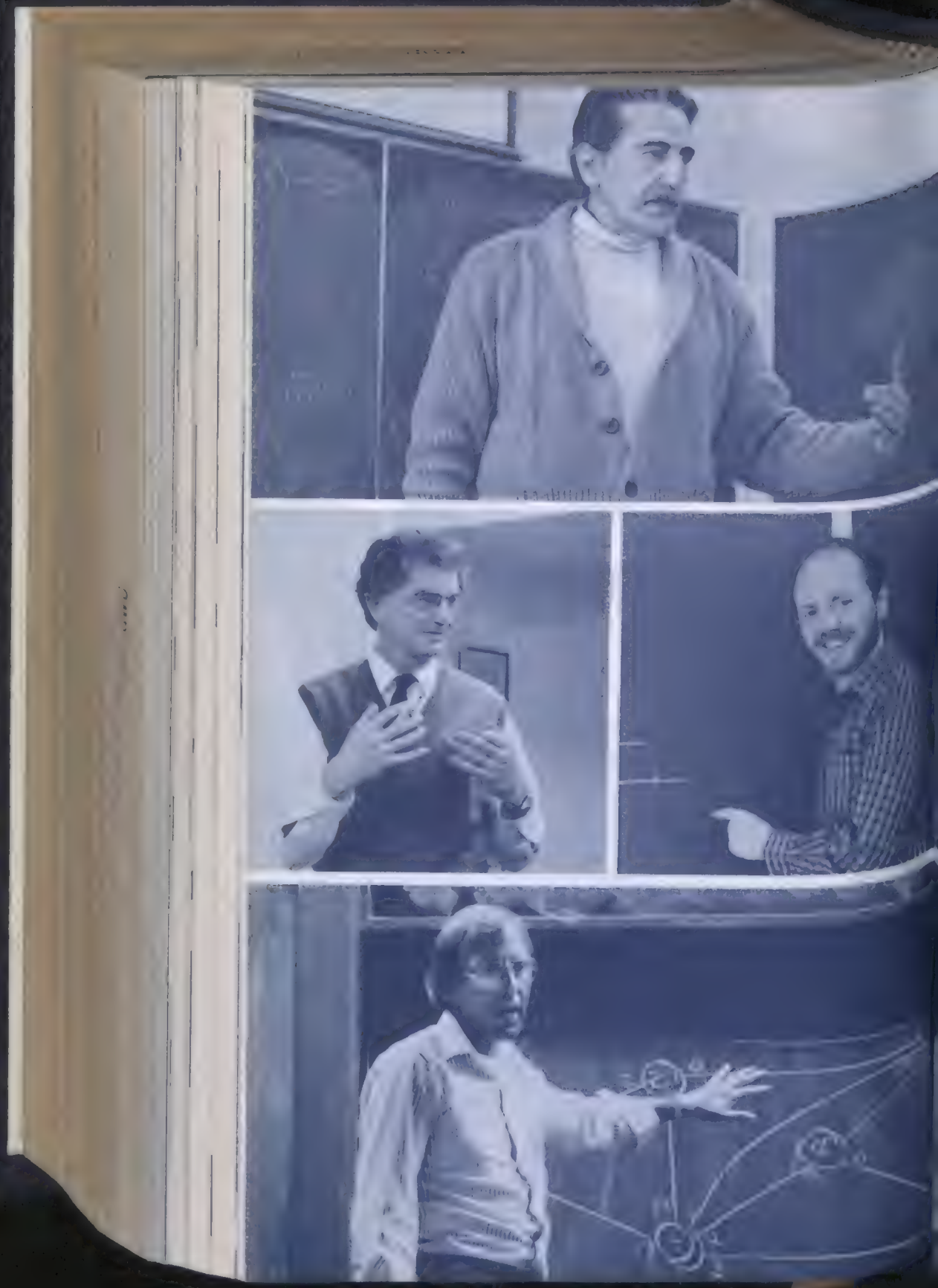
394 **Advanced Study** (arr.)
Limited to professional degree candidates in the department. May be repeated for credit. (As arranged)

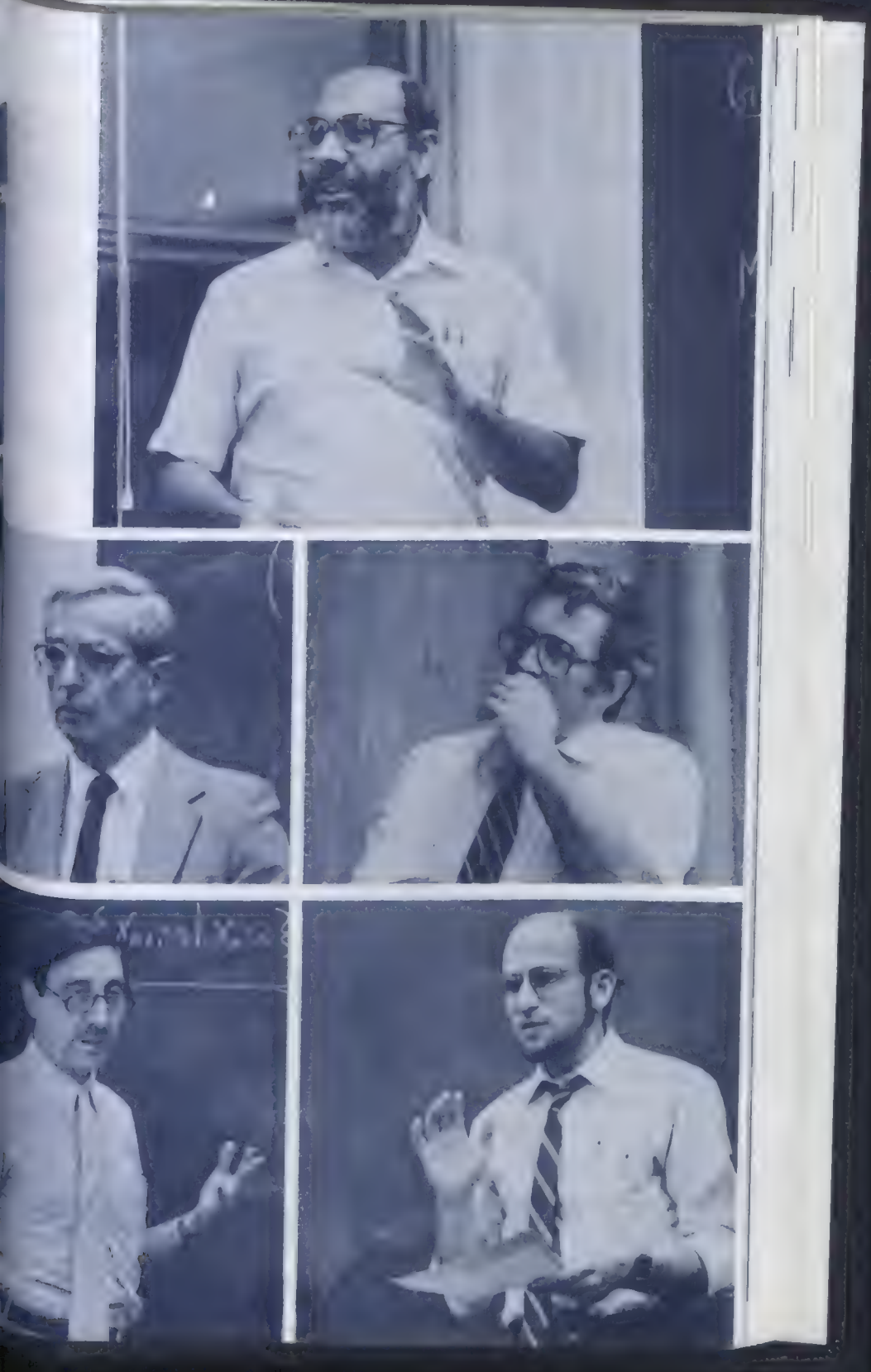
395–96 **Seminar: Professional Project** (3–3)
Limited to professional degree candidates in the department.
(Fall and Spring)

398 **Advanced Reading and Research** (arr.)
Limited to professional degree and Doctor of Science candidates. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit.
(Fall and Spring)


Operations Research





# Operations Research

***Professors*** W.H. Marlow, D. Gross *(Chair)*, N.D. Singpurwalla, A.V. Fiacco, G.P. McCormick, J.E. Falk, R.M. Soland, D.R. Miller
***Adjunct Professor*** R.H. Clark
***Professorial Lecturers*** J.D. Waller, C.C. Sherbrooke, W. R. Nunn, C. Anello, G.R. McNichols, D.R. Edmonds, S.J. Balut, P.J. Evanovich, W.P. Hutzler, J.F. Ince, J.W. Johnson, J.L. Kreuser, S.E. Nevius, B.D. Nussbaum, B.L. Schwartz, W.J. Smith
***Associate Professorial Lecturer*** M.F. McGrath
***Assistant Professor*** T.A. Mazzuchi *(Visiting)*

Programs in operations research lead to the degrees of Bachelor of Science, Master of Science, and Doctor of Science and to the professional degree of Applied Scientist.

## Undergraduate Program in Systems Analysis and Engineering

In systems analysis and engineering, scientific methods and engineering techniques are applied to the solution of management problems, particularly those concerning the most efficient and effective use of resources. Practitioners seek to observe, understand, and predict the behavior of human–machine systems so that the best decisions about these systems can be made.

Applications of systems analysis and engineering can be found almost everywhere—in the single waiting line now used at most banks and post offices; in the signal synchronization that improves traffic flow; in the routes and schedules of food distributors, delivery services, and garbage collectors. Other applications include choosing fire station locations; coordinating and scheduling tasks for large construction projects; scheduling the production of manufactured items such as automobiles and appliances; determining spare-parts needs for the automobile industry and for individual dealers; and calculating fair multiple-shift work schedules for airline crews, nurses, police officers, and emergency service personnel.

Systems analysis and engineering uses a body of specialized methods to design, analyze, and improve operations and management systems. It is an interdisciplinary field, combining many techniques and theories of engineering, mathematics, computer science, statistics, management, and economics.

Because of its great range of applications and varied scientific techniques, the profession is dynamic and vital. Systems analysis and engineering should be considered by the student who is interested in using mathematics, statistics, engineering, and other sciences to find practical solutions to problems.

### Core Curriculum

The first four semesters introduce the fundamentals of science and mathematics and include study in English, the humanities, and the social sciences.

During the last four semesters, the student concentrates on professional courses in operations research, computer science, engineering administration, and statistics. In addition, the student chooses a technical elective track in an

area of special interest, such as production systems, energy systems, management decision systems, computer systems, or financial systems.

### First Semester

CSci 51: Introduction to Computing (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Math 31: Single-Variable Calculus I (3)
Phys 13: General Physics for Engineering and Applied Science (3)
Elective: Selected from humanities or social sciences (3)

### Second Semester

Chem 13: General Chemistry (4)
CSci 53: Computers and Society (2)
CSci 56: FORTRAN Programming (1)
Math 32: Single-Variable Calculus II (3)
Phys 14: Mechanics and Thermal Physics (3)
Elective: Selected from humanities or social sciences (3)

### Third Semester

ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
CSci 161: Discrete Structures for Computing (3)
Math 33: Multivariable Calculus (3)
Phys 15: Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

### Fourth Semester

ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
ApSc 115: Engineering Analysis III (3)
CSci 147: Assembly Language Programming I (3)
Phys 16: Modern Physics (3)
Elective: Selected from humanities or social sciences (3)

## Systems Analysis and Engineering Curriculum

### Fifth Semester

ApSc 116: Engineering Analysis IV (3)
CSci 159: Programming and Data Structures (3)
Math 124: Introduction to Matrix Theory (3)
OR 101: Survey of Operations Research: Deterministic Models (3)
Stat 187: Introduction to Sampling (3)
Elective: Selected from humanities or social sciences (3)

### Sixth Semester

CSci 158: Algorithmic Methods (3)
EAd 160: Introduction to Engineering Economic Analysis (3)
OR 102: Survey of Operations Research: Stochastic Models (3)
Stat 118: Regression Analysis (3)
Elective: Technical elective selected from chosen track (see below) (3)
Elective: Selected from humanities or social sciences (3)

### *Seventh Semester*

CSci 155: Introduction to Numerical Methods for Computers (3)
OR 135: Systems Modeling for Management and Policy I (3)
OR 190: Applied Systems Analysis and Engineering (3)
Stat 181: Applied Time Series Analysis (3)
Elective: Technical elective selected from chosen track (3)

### *Eighth Semester*

OR 151: Linear Programming (3)
OR 173: Discrete Systems Simulation (3)
OR 191: Problems in Operations Research (3)
Elective: Two technical electives selected from chosen track (6)

## Technical Elective Tracks

Each systems analysis and engineering major must take four courses in one of the following technical elective tracks.

### *Computer Systems*

CSci 132: Theoretical Foundations of Computing (3)
CSci 151: System Software and Software Engineering (3)
CSci 156: Introduction to Operating Systems (3)
CSci 173: Theory of Computer Translators (3)
CSci 174: Symbolic and Logic Processing for Artificial Intelligence (3)
CSci 177: Programming for Management Systems (3)
CSci 178: Introduction to Database Management (3)

### *Control and Instrumentation Systems*

EE 11: Linear Networks I (3)
EE 12: Linear Networks II (3)
EE 172: Control Systems Design (3)
EE 184: Medical Engineering Instrumentation and Systems Design (3)

### *Electrical Energy Systems*

EE 11: Linear Networks I (3)
EE 12: Linear Networks II (3)
EE 31: Fields and Waves I (3)
EE 177: Electrical Energy Conversion (3)

### *Electromechanical Systems*

ME 117: Engineering Computations (3)
ME 126: Fluid Mechanics I (3)
ME 134: Introduction to Vibration Analysis (3)
ME 182: Electromechanical Control System Design (3)

### *Environmental Systems*

CE 193: Hydraulics (3)
CE 194: Environmental Engineering I: Water Supply and Resources (3)
CE 197: Environmental Engineering II: Waste and Pollution Control (3)
ME 126: Fluid Mechanics I (3)

### Financial Systems

Accy 51: Introductory Financial Accounting (3)
Accy 52: Introductory Managerial Accounting (3)
BAd 120: Business Finance (3)
BAd 123: Investment and Portfolio Management (3)

### Management Decision Systems

BAd 140: Basic Marketing Management (3)
BAd 183: Logistics Management (3)
BAd 188: Managing Production/Operations (3)
BAd 191: Fundamentals of Management (3)
CSci 177: Programming for Management Systems (3)
CSci 178: Introduction to Database Management (3)

### Mathematical Systems

Math 101: Introduction to Mathematical Logic (3)
Math 103: Computability (3)
Math 113: Graph Theory (3)
Math 121–22: Introduction to Abstract Algebra (3–3)
Math 139: Advanced Calculus I (3)
Math 140: Advanced Calculus II (3)
Math 157: Introduction to Complex Variable Theory (3)

### Mechanical Energy Systems

CE 140: Materials Science (3)
ME 131: Thermodynamics (3)
ME 148: Thermodynamic Systems (3)
ME 194: Energy Conversion (3)

### Naval Systems

NSc 52: Naval Ships Systems I (3)
NSc 125: Naval Ships Systems II (3)
NSc 150: Navigation and Naval Operations I (3)
NSc 151: Navigation and Naval Operations II (3)

### Network Systems

EE 11: Linear Networks I (3)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 113: Network Analysis and Design (3)

### Production Systems

BAd 188: Managing Production/Operations (3)
BAd 191: Fundamentals of Management (3)
CE 140: Materials Science (3)
ME 192: Manufacturing Processes and Systems (3)

### Statistical Systems

Stat 119: Analysis of Variance (3)
Stat 121: Contingency Table Techniques (3)
Stat 183: Intermediate Statistical Laboratory: Statistical Computing Packages (3)
Stat 188: Nonparametric Statistical Inference (3)

## Advanced Standing

Graduates of the systems analysis and engineering program are given 2 semester hours of advanced standing applicable to the master's program in operations research at GWU.

## Operations Research Undergraduate Courses

101 **Survey of Operations Research: Deterministic Models** (3)
Basic concepts and techniques of deterministic operations research modeling as applied to problems in industrial, governmental, and military decision making. Linear, integer, nonlinear, and dynamic programming; networks; game theory. Prerequisite: Math 33 or OR 130. (Fall, Spring, and Summer)

102 **Survey of Operations Research: Stochastic Models** (3)
Basic concepts and techniques of stochastic operations research modeling as applied to problems in industrial, governmental, and military decision making. Markov chains, queuing, inventory, reliability, forecasting, decision analysis, and simulation. Prerequisite: ApSc 115, Math 33 or OR 130. (Fall, Spring, and Summer)

130 **Computational Techniques for Management Science** (3)
Use of microcomputers in formulating and solving quantitative decision problems of management science and operations research. Elements of TRUEBASIC programming language; use of software packages; basic mathematical functions, linear equations and matrices, elementary calculus. Classes use microcomputers in the decision support systems laboratory. Prerequisite: Math 3. (Fall and Spring)

135 **Systems Modeling for Management and Policy I** (3)
Modeling techniques—including simulation, stock-flow analysis, and feedback systems—combined in a practical framework useful to policy analysis and management science. System dynamics is emphasized, and the principles of systems are employed as a means of structuring the problem-solving process. Problems and case studies are solved through use of microcomputers. (Fall)

151 **Linear Programming** (3)
The Simplex method and its variants considered from theoretical and computational points of view. Duality, sensitivity, and parametric programming. Large-scale optimization. Prerequisite: OR 101 or permission of instructor. (Fall and Spring)

173 **Discrete Systems Simulation** (3)
Monte Carlo simulation of discrete stochastic models. Modeling complex operations research systems. Simulation languages. Random-number and random-deviate generation. Statistical design and analysis of simulation experiments. Validation of simulation models. Applications such as queuing, inventory, scheduling, and computer models. Prerequisite: ApSc 116, CSci 51, OR 101, 102; or permission of instructor. (Spring)

190 **Applied Systems Analysis and Engineering** (3)
Practical and professional aspects of systems analysis and engineering. Use of existing computer software and development of student computer programs. Analysis and solution of case studies and design problems. Students use the decision support systems laboratory. Prerequisite: CSci 158; OR 101, 102. (Fall)

191 **Problems in Operations Research** (3)
Field experience in operations research on a team basis. Each small group locates an actual problem and formulates a solution using operations research models. Prerequisite: knowledge of FORTRAN or BASIC. (Fall and Spring)

# Graduate Study in Operations Research—Master of Science Degree Program

The master's program in operations research is designed for students with appropriate undergraduate backgrounds who wish to study analytic techniques of management decision making and their application.

Expanded scientific knowledge, combined with growing technological and social needs, has created increased demand for individuals trained in operations research. This discipline applies scientific principles and statistical and mathematical methodology to the study of complex industrial, military, and social systems in order to evaluate the probable consequences of proposed actions, establish criteria for judging the effectiveness of these actions, and assist decision making. The program in operations research provides a quantitative basis for solving problems involving the interaction of many components in the interest of the whole system. Most operations research efforts begin with specific aspects of a problem and proceed to consideration of the system as a whole.

## Admission Requirements

In addition to the requirements for admission to graduate study in the School, applicants for the master's program in operations research must have adequate knowledge of calculus, probability and statistics, and computer programming. This requirement can be met by satisfactory completion of ApSc 115 and 116 and CSci 100, or approved equivalents. These courses can usually be taken concurrently with graduate courses; however, the undergraduate courses do not fulfill any part of the requirements for the master's degree.

## Required Courses

The core courses in the field of operations research are OR 201, 202, 209, 210, and 299–300 (for those electing a thesis) or 291 (for the nonthesis option). Students must complete OR 201, 202, 209, and 210 before enrolling in other courses; in certain cases, however, permission may be granted for concurrent registration. Students electing OR 291 normally complete this course in the last semester of study. The remainder of the program is selected, with the approval of the adviser, in an area of concentration from courses in the Department of Operations Research or other departments of the University.

## Areas of Concentration

The goal of the Department of Operations Research is to provide programs flexible enough to accommodate both students interested in applications and those interested in theory. Specific areas of concentration and suggested departmental electives follow.

### *General Operations Research*

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 261: Theory of Games
OR 273: Discrete Systems Simulation
OR 277: Queuing Theory
OR 279: Inventory Control

With the approval of the adviser, other courses within the department may be elected.

### Defense Science

OR 235: Systems Modeling for Management and Policy I
OR 236: Systems Modeling for Management and Policy II
OR 237: Logistics Planning
OR 251: Linear Programming
OR 261: Theory of Games
OR 262: Decision Analysis
OR 273: Discrete Systems Simulation
OR 281: Reliability Theory I

With the approval of the adviser, other courses within the department may be elected.

### Energy Systems

OR 235: Systems Modeling for Management and Policy I
OR 236: Systems Modeling for Management and Policy II
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 271: Forecasting Techniques
OR 277: Queuing Theory
OR 279: Inventory Control

With the approval of the adviser, courses may be elected from the Department of Civil, Mechanical, and Environmental Engineering.

### Logistics Engineering

OR 235: Systems Modeling for Management and Policy I
OR 236: Systems Modeling for Management and Policy II
OR 237: Logistics Planning
OR 251: Linear Programming
OR 253: Integer and Network Programming
OR 271: Forecasting Techniques
OR 275: Introduction to Scheduling
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Departments of Economics, Engineering Administration, Management Science, and Electrical Engineering and Computer Science.

### Mathematical Modeling in Information Systems

OR 251: Linear Programming
OR 271: Forecasting Techniques
OR 273: Discrete Systems Simulation
OR 275: Introduction to Scheduling
OR 277: Queuing Theory

With the approval of the adviser, courses may be elected from the Departments of Electrical Engineering and Computer Science, Engineering Administration, and Management Science.

### Mathematical Optimization

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 253: Integer and Network Programming
OR 261: Theory of Games
OR 275: Introduction to Scheduling

With the approval of the adviser, courses may be elected from applied science offerings and the Department of Mathematics.

### Model Building for Transportation Flows

OR 231: Theory of Traffic Flow
OR 235: Systems Modeling for Management and Policy I
OR 236: Systems Modeling for Management and Policy II
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 254: Applications of Linear and Nonlinear Optimization Theory
OR 273: Discrete Systems Simulation
OR 277: Queuing Theory
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Departments of Civil, Mechanical, and Environmental Engineering; Engineering Administration; and Urban and Regional Planning.

### Operations Research in Industrial Engineering Systems

OR 237: Logistics Planning
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 254: Applications of Linear and Nonlinear Optimization Theory
OR 271: Forecasting Techniques
OR 273: Discrete Systems Simulation
OR 275: Introduction to Scheduling
OR 277: Queuing Theory
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, other courses within the department may be elected.

### Quantitative Decision Making for Public Policy

OR 235: Systems Modeling for Management and Policy I
OR 236: Systems Modeling for Management and Policy II
OR 251: Linear Programming
OR 254: Applications of Linear and Nonlinear Optimization Theory
OR 261: Theory of Games
OR 271: Forecasting Techniques
OR 273: Discrete Systems Simulation

With the approval of the adviser, courses may be elected from the Departments of Civil, Mechanical, and Environmental Engineering; Economics; Public Administration; and Urban and Regional Planning.

### Stochastic Modeling

OR 271: Forecasting Techniques
OR 273: Discrete Systems Simulation
OR 277: Queuing Theory
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Department of Statistics.

## Graduate Study in Operations Research with a Concentration in Management Science—Master of Science Degree Program

The master's program in operations research with a concentration in management science teaches students to apply quantitative techniques to problems of managerial control, decision making, and policy analysis. While it develops knowledge of basic mathematics, the program is oriented toward quantitative modeling of problems and their solution using modern management science software.

### Admission Requirements

In addition to the requirements for admission to graduate study in the School, applicants for the master's program in operations research with a concentration in management science must have adequate introductory knowledge of mathematics and statistics. This requirement can be met by satisfactory completion of ApSc 115 and OR 130, or approved equivalents.

### Required Courses

Core courses required in the field of management science are EAd 281 and 287, OR 201, 202, 235, 236, and 299–300 (for those electing a thesis) or 291 (for the nonthesis option). Students electing OR 291 normally complete this course in the last semester of study. The remainder of the program is generally selected, with the approval of the adviser, from courses in the Departments of Operations Research, Engineering Administration, and Economics. The following courses are recommended:

EAd 251: Management of Information Resources
EAd 253: Production Management
EAd 254: Computer Systems in Information Management
EAd 270: Cooperating Expert Systems
EAd 282: Systems Analysis and Management II
EAd 295: Management of Technical Information
Econ 217–18: Survey of Economics
OR 251: Linear Programming

## Professional Degree Program

This program of advanced study and research leads to the degree of Applied Scientist. The program is designed for students interested in pursuing study beyond the master's degree with emphasis on applied subject matter rather than on basic research.

### Admission Requirements

Applicants must meet the general requirements for admission to study toward the professional degree in the School: an appropriate master's degree from a recognized institution; a bachelor's degree in engineering, mathematics, or administration; and evidence of a capacity for productive work as indicated by prior scholarship. In certain cases, applicants who have equivalent quantitative backgrounds may be considered.

### Program of Study and Requirements

The program of study consists of an applied operations research major and an applied out-of-department minor. A minimum of 30 semester hours is required to earn the professional degree, including (a) a minimum of 12 hours in operations research, (b) Stat 201–2, (c) a 9-hour applied minor in a field other than operations research, and (d) either a 3-hour professional degree project (OR 391) or another 300-level course in operations research. Appropriate minor areas include economics; engineering administration; systems analysis; computer science; systems science, networks, and controls; urban and regional planning; transportation systems; environmental engineering; and energy systems. Professional degree candidates in operations research must pass the department's Master's Comprehensive Examination before their final program of study can be approved. Full-time students are advised to take the comprehensive within one year of their admission; all students must take the examination within two years. Extensions are permitted at the department's discretion.

## Doctor of Science Degree Program

### Admission Requirements

Applicants must meet the general requirements for admission to doctoral study in the School. Outstanding professional performance is also considered in evaluating applicants.

### Language Requirement

No foreign language is required for the Doctor of Science degree program in operations research. A proficiency in one computer programming language must be demonstrated before the student is admitted to the doctoral qualifying examination.

### Programs of Study

Doctoral programs are planned to give students sufficient breadth in operations research and depth in areas of specialization to enable them to complete dissertations that will make significant contributions to the field. Possible areas of study include mathematical programming, multicriteria decision making, inventory, queuing, and reliability. In addition to the major in operations research, two minor areas of concentration are normally required. One minor generally is in applied science, mathematics, or statistics. The second minor may be chosen from within the department or from other departments of the University, such as business administration; civil, mechanical, and environmental engineering; economics; electrical engineering and computer science; engineering administration; health care administration; management science; and urban and regional planning. Incoming doctoral candidates will be required to take the department's Master's Comprehensive Examination and must demonstrate superior performance on that examination before final approval of the program of study can be granted. Doctoral candidates must attempt the comprehensive within two years of their admis-

sion; full-time students usually take it within one year. Extensions may be granted at the discretion of the department. For the general requirements for doctoral study, see page 34.

## Professional Fields and Research Interests of Operations Research Faculty

| | Areas of Specialization | Research Interests |
|---|---|---|
| **James E. Falk** | Mathematical programming<br>Numerical methods<br>Mathematical modeling | Nonconvex programming<br>Sequential optimization problems<br>Sequential games<br>Application of optimization methods to economics, military, logistics, and location problems |
| **Anthony V. Fiacco** | Mathematical programming<br>Numerical methods<br>Mathematical modeling<br>Stability analysis | Penalty function methods<br>Approximation and sensitivity analysis in nonlinear programming<br>Parametric solution and bounding techniques<br>Applications to water pollution, structural design, energy, and manpower |
| **Donald Gross** | Inventory theory<br>Queuing theory | Queuing approximations<br>Numerical computations for queues<br>Inventory models<br>Closed queuing networks |
| **W.H. Marlow** | Mathematical methods and numerical procedures in operations research and management science | Logistics<br>Systems effectiveness |
| **Garth P. McCormick** | Mathematical programming<br>Numerical methods<br>Mathematical modeling | Rate of convergence of algorithms<br>Nonconvex programming<br>Mathematical programming applied to pollution problems and conservation of resources<br>Energy modeling |
| **Douglas R. Miller** | Applied probability<br>Stochastic processes<br>Simulation<br>Mathematical statistics | Stochastic models in polymer engineering<br>Algorithms for solving queuing and inventory models<br>Software reliability |

| | Areas of Specialization | Research Interests |
|---|---|---|
| **Nozer D. Singpurwalla** | Applied probability and Bayesian statistics<br>Reliability theory and quality control<br>Time series analysis<br>Fault tree analysis<br>Filtering theory<br>Uncertainty in expert systems | Applications of time series analysis to reliability problems<br>Extreme value theory and applications<br>Software reliability<br>Maintenance policies<br>Reliability modeling |
| **Richard M. Soland** | Mathematical modeling<br>Discrete optimization<br>Decision analysis<br>Multiple-criteria decision making | Missile defense problems<br>Interactive multiple-criteria decision making<br>Solution and applications of structured integer programming problems<br>Discrete optimization in stochastic systems |

## Operations Research Graduate Courses

201 **Survey of Operations Research: Deterministic Models** (3)
Basic concepts and techniques of deterministic operations research modeling as applied to problems in industrial, governmental, and military decision making. Linear, integer, nonlinear, and dynamic programming; networks; game theory. Prerequisite: Math 33 or OR 130. (Fall, Spring, and Summer)

202 **Survey of Operations Research: Stochastic Models** (3)
Basic concepts and techniques of stochastic operations research modeling as applied to problems in industrial, governmental, and military decision making. Markov chains, queuing, inventory, reliability, forecasting, decision analysis, and simulation. Prerequisite: ApSc 115, Math 33 or OR 130. (Fall, Spring, and Summer)

209 **Mathematics in Operations Research I** (3)
Methods for developing deterministic decision models in operations research involving a number of variables. Applications of linear models for resource allocations. Applications to data representation and algorithmic procedures for linear and nonlinear optimization models. Applications of linear algebra and real multivariate analysis. Prerequisite: Math 33. (Fall and Spring)

210 **Mathematics in Operations Research II** (3)
Methods for developing stochastic decision models in operations research involving applications of complex variables. Applications of linear differential, difference, and differential–difference systems to various areas in operations research. Applications of modern numerical methods. Prerequisite: Math 33. (Fall and Spring)

231 **Theory of Traffic Flow** (3)
Definitions and measurement of traffic stream parameters, dynamic theories. Follow-the-leader models of traffic flow, kinematic theories and fluid analogies, traffic cybernetics, statistical distributions and queuing theory, stochastic approaches to static delay problems, simulation of traffic problems. Prerequisite: ApSc 115, Math 33. (As arranged)

233 **Analytic Models for Management and Administration** (3)
Application of quantitative methods and concepts and experimental techniques taken from system theory, simulation, decision analysis, discounting, queuing, mathematical programming, and functional analysis. For graduate students outside the School of Engineering and Applied Science.

235 **Systems Modeling for Management and Policy I** (3)
Modeling techniques—including simulation, stock-flow analysis, and feedback systems—combined in a practical framework useful to policy analysis and management science. System dynamics is emphasized, and the principles of systems are employed as a means of structuring the problem-solving process. Problems and case studies are solved through use of microcomputers. (Fall)

236 **Systems Modeling for Management and Policy II** (3)
Delays, feedback, and sampling in dynamic problems. Case studies in dynamic policy analysis. Use of microcomputers, electronic spreadsheets, statistics, and simulation. Includes small-group projects. Prerequisite: OR 235. (Spring)

237 **Logistics Planning** (3)
Quantitative methods in model building for logistics systems, including organization, procurement, transportation, inventory, maintenance, and their interrelationships. Stresses applications. Prerequisite: ApSc 115, Math 33. (Spring, even years)

251 **Linear Programming** (3)
The Simplex method and its variants considered from theoretical and computational points of view. Duality, sensitivity, and parametric programming. Large-scale optimization. Prerequisite: OR 201 or permission of instructor. (Fall and Spring)

252 **Nonlinear Programming I** (3)
Basic theoretical and computational topics in optimization theory, including convexity and the optimality conditions. Algorithms for solving unconstrained, linearly constrained, and nonlinearly constrained problems. Applications. Prerequisite: OR 201 or permission of instructor. (Spring)

253 **Integer and Network Programming** (3)
Methods and applications of optimization problems requiring integral solutions. Implicit enumeration, branch-and-bound, and cutting plane methods. Network programming, including shortest route, maximum flow, minimum cost flow, and minimum spanning tree problems. Elements of computational complexity. Prerequisite: OR 201, 251; or permission of instructor. (Fall, even years)

254 **Applications of Linear and Nonlinear Optimization Theory** (3)
Introduction to penalty function methods for solving linear and nonlinear optimization problems through use of existing computer codes. Formulation of optimization models in application areas of structural design, nutrition, pollution control, inventory control, energy, economics, psychology, statistics, and chemical processes. Prerequisite: Math 33. (Fall)

261 **Theory of Games** (3)
Study of mathematical models with applications to the relationships among independent competitive entities (that is, persons or organizations in an environment of competition, bargaining, or bidding), selection of optimum strategies, mini–max concept, connections with linear programming, topics in fair division, two-person and *n*-person zero and nonzero sum games. Prerequisite: OR 201 or permission of instructor. (Fall)

262 **Decision Analysis** (3)
Study of decision making under certainty and uncertainty and under one and several criteria. Decision analysis and decision trees, the value of information, subjective probability and Bayesian statistics, utility and value theories, multiple-criteria decision making and multiple-criteria optimization, goal programming. Prerequisite: ApSc 116, OR 201, 202; or permission of instructor. (Spring, odd years)

271 **Forecasting Techniques** (3)
Introduction to various techniques of forecasting available to an operations research analyst or engineer. Topics include the use of regression analysis in forecasting and other heuristic forecasting techniques. Emphasis on detailed development of the Box–Jenkins technique for time-series analysis, including moving averages and exponential smoothing as special cases. Application to engineering, business, and economic situations, using special computer software packages. Prerequisite: ApSc 116, OR 202. (Fall, odd years)

273 **Discrete Systems Simulation** (3)
Monte Carlo simulation of discrete stochastic models. Modeling complex operations research systems. Simulation languages. Random-number and random-deviate generation. Statistical design and analysis of simulation experiments. Validation of simulation models. Applications such as queuing, inventory, scheduling, and computer models. Prerequisite: ApSc 116, CSci 51, OR 201, 202; or permission of instructor. (Spring)

275 **Introduction to Scheduling** (3)
Theory of scheduling with emphasis on industrial applications, assembly line balancing, sequencing and scheduling of jobs in machine shops. Mathematical optimization, heuristic programming, and computer simulation approaches to these problems. Prerequisite: OR 201, 202, 251; or permission of instructor. (As arranged)

277 **Queuing Theory** (3)
Characterization of queuing systems. Single-channel exponential models. Additional Markovian single- and multiple-channel models, including birth–death processes, finite sources, bulk queues, Erlangian models, and series queues. Models with general arrival and service patterns. Model building, basic solution techniques, and formal theoretical developments. Prerequisite: ApSc 116, OR 202; or permission of instructor. (Spring)

279 **Inventory Control** (3)
Application of mathematical techniques to decisions about when and how much to produce or purchase. Various mathematical models of inventory systems with deterministic and stochastic demands, continuous and periodic review policies, multi-item models with constraints, multi-echelon models. Demand uncertainty and forecasting in inventory models. Prerequisite: ApSc 116, OR 202; or permission of instructor. (Fall)

281 **Reliability Theory I** (3)
Topics introducing mathematical and statistical theories of reliability. Mathematical theory: theory of coherent structures, association of random variables, stochastic characterization of wear, total positivity, preservation theorems, bounds and inequalities. Statistical theory: probabilistic derivation of failure models; censored, truncated, and sequential life testing procedures using Bayesian techniques; commonly used military standard plans. Prerequisite: ApSc 116, OR 202. (Fall)

282 **Quality Control and Acceptance Sampling** (3)
Topics covering mathematical and statistical approaches to quality assurance. Control charts, acceptance sampling by attributes and variables, outgoing quality levels, cost of quality, relationship between reliability and quality, Bayesian techniques and time-series methods. Prerequisite: ApSc 116, OR 271 or 281, or permission of instructor. (Spring, odd years)

291 **Problems in Operations Research** (3)
Field experience in operations research on a team basis. Each small group locates an actual problem and formulates a solution using operations research models. Prerequisite: Knowledge of FORTRAN or BASIC. (Fall and Spring)

297 **Special Topics in Operations Research** (3)
Selected topics in operations research, as arranged. May be repeated for credit. Prerequisite: permission of instructor. (As arranged)

298 **Research** (arr.)
Basic or applied research in operations research. May be repeated for credit. (Fall and Spring)

299–300 **Thesis Research** (3–3)
(Fall and Spring)

351 **Advanced Topics in Mathematical Programming** (3)
Special topics selected from fractional and geometric programming, branch-and-bound methods, max–min problems, pseudo-Boolean programming, calculus of variations, optimal control, penalty function methods, Lagrangian algorithms, fixed-point procedures, sensitivity analysis, and large-scale programming. Prerequisite: OR 252 or permission of instructor. (Spring)

352 **Nonlinear Programming II** (3)
Continuation of OR 252. Optimality conditions, convex analysis, and the development of families of unconstrained and constrained algorithms studied in greater depth. Key results selected for discussion from several topics of current importance in mathematical programming, such as duality, rate of convergence, nonconvex programming, factorable functions, and sensitivity analysis. Prerequisite: OR 252 or permission of instructor. (Fall)

371 **Advanced Topics in Forecasting** (3)
Continuation of OR 271. Estimation of parameters of Box–Jenkins models, transfer function models for relating two or more time series, models for intervention analysis and for feedforward and feedback control schemes. Kalman filtering and Bayes empirical Bayes methods in forecasting. Other techniques useful in forecasting, such as spectral analysis of time series, including cross-spectral analysis and Fourier analysis. Review and discussion of current literature. Prerequisite: OR 271 or permission of instructor. (Spring, even years)

377 **Advanced Stochastic Models in Operations Research** (3)
Selected applied probability models, including the Poisson process, renewal theory, Markov chains, semi-Markov processes, regenerative processes, and continuous-time, denumerable-state Markov processes. Applications to queues, inventories, and other operations research systems. Special topics. Prerequisite: ApSc 116, OR 277; or permission of instructor. (Fall)

381 **Reliability Theory II** (3)
Topics of current interest in the mathematical and statistical theories of reliability. Mathematical theory includes stochastic characterization of multivariate survival, shock models and wear processes, and reliability theory for multistate components. Statistical theory includes recent developments in analysis of failure data. Prerequisite: OR 281. (Spring, odd years)

391 **Project for Professional Degree** (3)
Limited to students in the professional degree program. (Fall and Spring)

397 **Advanced Topics in Operations Research** (3)
Advanced topics from the literature of operations research for analysis, presentation, and discussion. Reading assignments from professional journals selected by the instructor and the student. May be repeated for credit. Admission by permission of instructor. (As arranged)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and Spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and Spring)





# Courses Offered by Columbian College

Descriptions of English as a Foreign Language courses and required courses in SEAS undergraduate curricula offered by Columbian College of Arts and Sciences are given below. See the *Undergraduate and Graduate Programs Bulletin* for elective courses in the humanities and social sciences and technical electives offered by departments outside of SEAS.

## *Biological Sciences*

**11–12 Introductory Biology for Science Majors (4–4)**
Lecture (3 hours), laboratory (3 hours). BiSc 11: Investigation of principles of inheritance, physiology, development, and cell biology. BiSc 12: General survey of microorganisms, plants, and animals, including morphology, physiology, embryology, ecology, and evolutionary relationships among phyla. Designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Laboratory fee, $40 per semester. (Academic year)

## *Chemistry*

**13 General Chemistry (4)**
For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure, chemical bonding; chemical equations; acids and bases; chemical equilibrium; liquid and solid states; periodicity; electrochemistry. Prerequisite or concurrent registration: Math 31, Phys 14. Laboratory fee, $35. After completion of Chem 13, Chem 11–12 may not be taken for credit. (Fall and Spring)

**22 Introductory Quantitative Analysis (3)**
Theory and practice of quantitative analysis by modern methods; evaluation of analytic data emphasizing detection and correction of experimental errors. Correlated with Chem 23. Prerequisite: Chem 12, 13, or 16. (Fall and Spring)

**23 Introductory Quantitative Analysis Laboratory (2)**
Laboratory complement to Chem 22. Prerequisite or concurrent registration: Chem 22. Laboratory fee, $35. (Fall and Spring)

**151–52 Organic Chemistry (3–3)**
Introductory course for science majors and others preparing for related graduate work. Systematic treatment of the structure, preparation, properties, and reactions of the principal classes of organic compounds. Fundamental principles of stereochemistry, reaction mechanisms, and spectroscopic methods of analysis are included. Credit may not be earned for both Chem 50 and Chem 151–52. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)

**153–54 Organic Chemistry Laboratory (1–1)**
Laboratory complement of Chem 151–52. Introduction to and practice in basic skills of synthesis, separation, and purification of organic compounds. Prerequisite or concurrent registration: Chem 151–52. Prerequisite to Chem 154: Chem 153. Laboratory fee, $35 per semester. (Academic year)

## *English*

**9 English Composition: Language as Communication (3)**
Includes content of Engl 10; offers the advantage of more intensive work on analytical reading and on fluency and control in the writing process. Class meets 5 hours per week. Special fee, $25. (Fall and Spring)

**10 English Composition: Language as Communication (3)**
Practice of expository techniques in writing assignments ranging from the autobiographical to the academic; emphasis on the writing process, with

guidance in revising toward meaningful, engaging, idiomatic, and controlled discourse; analysis of such discourse through readings in professional writing and good student prose. (Fall and Spring)

110 **Writing in Engineering and the Sciences** (3)
Study of writings by engineers and scientists who have considered the implications of technology in the modern world. Concurrently, study and practice of the communication skills needed for careers in engineering and the sciences. Prerequisite: Engl 9 or 10 or EFL 50; junior, senior, or graduate status. Material fee, $5. (Spring)

## English as a Foreign Language

15 **Intensive Basic English** (0)
Introduction to basic grammar, vocabulary, and composition. Development of reading, speaking, and listening skills. Twenty class hours per week. Students registered in EFL 15 will not be permitted to register for any other academic course. Tuition is charged at the rate of seven semester hours; laboratory fee, $70.

20 **Intensive Lower-Intermediate English** (0)
Continued study of basic grammar. Continued practice in speaking, listening, reading, vocabulary, and composition. Emphasis on integration of skills. Twenty class hours per week. Students registered in EFL 20 will not be permitted to register for any other academic course. Tuition is charged at the rate of seven semester hours; laboratory fee, $70.

30 **Intensive Intermediate English** (0)
Continued practice of grammar with emphasis on complex structures. Further practice in reading, vocabulary, oral communication, and composition. Introduction to academic lectures and note-taking practice. Twenty class hours per week. Students registered in EFL 30 will not be permitted to take additional academic work without approval of the adviser. Tuition is charged at the rate of seven semester hours; laboratory fee, $35.

40 **Intensive Higher-Intermediate English** (0)
Emphasis on skills needed in academic course work. Continued practice in complex grammar, oral communication, vocabulary, note-taking skills, and composition. Practice in reading strategies for unadapted material. Introduction to basic research techniques. Twenty class hours per week. Students registered in EFL 40 will not be permitted to take additional academic work without approval of the adviser. Sections are offered with general academic and technical emphasis. Tuition is charged at the rate of seven semester hours; laboratory fee, $35.

45 **Semi-Intensive Advanced English** (0)
Emphasis on skills needed in academic course work. Selective review of grammar. Practice in reading university-level materials, speaking, and study skills. Continued practice in composition and research techniques. Ten class hours per week. Tuition is charged at the rate of five semester hours.

50 **English Composition/Research Methods for International Students** (3)
Composition and library research methods course for students who demonstrate high proficiency in English. Four class hours per week. This course can be taken by international students in lieu of Engl 9 or 10. Sections are offered with general academic and technical emphasis. Special fee, $25.

## eology

136 **Introduction to Engineering Geology** (3)
For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Phys 2 or equivalent, or permission of instructor. Laboratory fee, $20. (Fall and Spring)

## Mathematics

**31 Single-Variable Calculus I** (3)
Differentiation and integration of algebraic functions, exponentials, and logarithms with simple applications. Arc length. Conic sections. Prerequisite: Math 30 or equivalent. (Fall and Spring)

**32 Single-Variable Calculus II** (3)
Calculus of trigonometric and hyperbolic functions. Techniques of integration. Taylor formula. L'Hopital's rules. Infinite series; polar coordinates; three-dimensional vectors. Prerequisite: Math 31. (Fall and Spring)

**33 Multivariable Calculus** (3)
Vector-valued functions. Partial differentiation. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32. (Fall and Spring)

**124 Introduction to Matrix Theory** (3)
Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors. Hamilton–Cayley theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or 42, or permission of instructor. (Fall and Spring)

## Physics

**13 General Physics for Engineering and Applied Science** (3)
Lecture (3 hours), recitation and laboratory (2 hours). Development of basic principles of optics and dynamics. Topics include geometrical optics, vector algebra, statics of rigid bodies, hydrostatics, single-particle kinematics and dynamics, conservation of energy. Concurrent registration in Math 31 is required. Laboratory fee, $20.

**14 Mechanics and Thermal Physics** (3)
Lecture (3 hours), recitation and laboratory (2 hours). Elementary development of mechanics for many-particle systems and basic thermodynamics. Topics include collisions, rotational motion, small vibrations, gravitation, fluid dynamics, wave motion, the ideal gas, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 13, Math 31. Laboratory fee, $20.

**15 Electricity and Magnetism** (3)
Lecture (3 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Topics include static electric fields, Coulomb's Law, Gauss's Law, electrical potential, capacitance and dielectrics, electric current and resistance, Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 14, Math 31. Laboratory fee, $20.

**16 Modern Physics** (3)
Lecture (3 hours), recitation and laboratory (2 hours). Elementary approach to the basic principles of special relativity and quantum theory. Topics include relativistic kinematics and dynamics, wave–particle duality, the hydrogen atom, Pauli's exclusion principle, X-ray spectra, the atomic nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid-state physics. Prerequisite: Phys 14, 15; Math 32. Laboratory fee, $20.

## Statistics/Computer and Information Systems

**118 Regression Analysis** (3)
Lecture (3 hours), laboratory (1 hour). Simple and multiple linear regression, partial correlation, residual analysis, stepwise model building, multicollinearity and diagnostic methods, indicator variables. Prerequisite: 3 semester hours selected from Stat 51, 53, 91, 104, 127, or ApSc 115. (Fall and Spring)

181 **Applied Time Series Analysis** (3)
Autoregressive integrated moving average (ARIMA) modeling and forecasting of univariate time series. Estimation of spectral density functions, white noise tests, and tests for periodicities. Theory and applications using SAS on the GWU computer. Prerequisite: Math 33, Stat 157–58 or 118.

187 **Introduction to Sampling** (3)
Problems of sampling and sample design. Prerequisite: Stat 91 or ApSc 115, or equivalent. (Fall)






THE GEORGE WASHINGTON UNIVERSITY
CHARLES HOOK TOMPKINS
BY THE GEORGE WASHINGTON UNIVERSITY

# General Information

## Registration

The dates, hours, and place of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

Registration in on-campus courses is open only to those persons formally admitted to the University by the appropriate admitting office, as well as those students in good standing who are continuing in an approved program of study.

No registration is accepted for less than one semester or one summer session.

A student may not register concurrently in this University and another institution that is not a member of the Consortium of Universities of the Washington Metropolitan Area, Inc., without the prior permission of the dean of the college, school, or division in which the student is registered in this University. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned prior to registration. Forms for requesting concurrent registration are available from the SEAS Admissions and Registration Office.

### Eligibility for Registration

Registration for the following categories of on-campus students is held on the days of registration stated in the University Calendar and published in the *Schedule of Classes*. A student who is suspended or whose record is not clear for any reason is not eligible to register.

***New Student.*** Upon receipt of a letter of admission, a new student is eligible for registration on the stated days of registration.

***Readmitted Student.*** A student previously registered in the University who was not registered on campus during the preceding semester or summer sessions must apply for and be granted readmission by the appropriate admitting office before the student is eligible for registration.

***Continuing Student.*** A student registered on campus or having continuous-enrollment or leave-of-absence status in the immediately preceding semester or summer sessions is eligible to register, assuming good standing and enrollment in a continuing program.

### Preregistration

Continuing students are encouraged to preregister for courses for the following semester. Students are cautioned, however, that preregistration in a program courses is predicated on satisfactory completion of all prerequisites for the courses and on meeting scholastic requirements.

The School reserves the right to cancel the preregistration of any student who has not met the requirements for satisfactory academic performance.

## Completion of Registration

Registration is not complete until financial obligations have been fulfilled. Attendance in class is not permitted until registration has been completed.

## Registration Changes and Withdrawals

See pages 219 and 231–32.

## Registration for Consortium Courses

Degree students interested in taking courses at any of the other institutions in the Consortium of Universities of the Washington Metropolitan Area, Inc., should consult the program announcements of the other institutions. Consortium registration forms and instructions may be picked up in the Office of the Registrar after obtaining registration materials. To participate in the Consortium program, students must obtain the approval of an adviser and should ascertain from the department of the institution where the course is taught whether they are eligible for the course and whether there is space in the class. Specific inquiries should be addressed to the registrar.

# Fees and Financial Regulations

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution makes up the difference.

The following fees and financial regulations were adopted for the 1988 summer sessions and the academic year 1988–89.

### *Tuition Fees*

| | |
|---|---|
| Each semester hour, not to exceed $5,254 per fall or spring semester .. | $391.00 |
| Each semester hour, summer sessions..... | 345.00 |

***Marvin Center Fee*** (charged all students registered on campus)
Each semester hour, to a maximum of $100.50 per semester ..... 9.50

***Additional Course Fees***—In certain courses additional fees, such as laboratory and materials fees, are charged by semester as indicated in the course descriptions. If breakage of apparatus is in excess of the normal amount provided for in the laboratory fee, the student will be required to pay such additional charges as are determined by the department concerned.

***Computer Usage Fees*** (charged for courses that use the computer facilities of the University)—Applicable fees are listed in the *Schedule of Classes* for each semester. The maximum computer usage fee is $100 for any semester.

***Residence Hall Fees***—See page 242.

### *Special Fees and Deposits*

| | |
|---|---|
| Application fee (undergraduate degree candidates), nonrefundable | $30.00 |
| Application fee (graduate degree candidates), nonrefundable | 35.00 |
| Advance tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student | 100.00 |
| Housing deposit, nonrefundable, charged each applicant for residence hall space | 300.00 |
| Admission tests (when required) | 15.00 |
| Late-registration fee, for failure to register within the designated period (charged on-campus students only): | |
| During first week of classes | 25.00 |
| During second and third week of classes | 50.00 |
| After third week of classes (if permitted) | 100.00 |
| Late-payment fee (see Payment of Fees, below) | 15.00 |
| On-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below) | 35.00 |
| Off-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below) | 15.00 |
| Returned-check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason | 15.00 |
| Binding master's thesis | 15.00 |
| Microfilm service and printing announcement of final examination (doctoral candidates) | 75.00 |
| Engineers' Council fee, charged each student in the School of Engineering and Applied Science for each semester or any part thereof, except the summer term | 8.00 |
| Special Columbian College of Arts and Sciences departmental examination to qualify for receiving credit (advanced standing), waiver of requirement, or both | 50.00 |
| Waiver examination to qualify for advanced placement | 20.00 |
| English test for international students (when required) | 15.00 |
| Laboratory checkout fee, for failure to check out of chemistry laboratory by the deadline date set by the instructor (a student who drops a chemistry course before the end of the semester must check out of the laboratory at the next laboratory period) | 10.00 |
| Transcript fee | 2.00 |
| Replacement of lost or stolen picture identification card | 2.00 |

Registration for on-campus courses in the University entitles each student to the following: (1) the use of the University Library, (2) gymnasium privileges, (3) the services of the Career Services Center, (4) admission to all athletic contests, unless otherwise specified, (5) the *Hatchet*, the student newspaper, and (6) medical attention as described under Student Health Service. These privileges terminate when the student withdraws or is dismissed from the University.

## Payment of Fees

No student is permitted to complete registration or attend classes until all charges are paid or until arrangements for payment have been made. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks should be made payable to George Washington University, with the student identification number in the upper left corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for 6 semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration, permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Interest at the rate of 8 percent per annum on the unpaid balance will be charged from the date of registration to the date payment is made. A 10-month payment plan is also available.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $2,000 or more. Under such circumstances the student may be permitted to pay one-half of the amount due at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will automatically be charged a $15 late-payment fee and will be subject to the interest charge of 8 percent per annum. Accounts that become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters and the Student Accounts Office will notify the registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled. In addition, applications for institutional and federal financial aid cannot be processed until all encumbrances, including those for unpaid emergency loans, have been paid. Financial settlement will require payment in full of all amounts due to the University in addition to a financial reinstatement fee of $35. Accounts that must be referred to a collection service will be assessed all collection costs, including fees charged by the collection agency.

Students auditing courses are subject to all fees charged to students registered for credit.

***Returned-Check Policy.*** A student whose check is returned unpaid by the bank for any reason will be charged a returned-check fee. If the check is not paid within 15 days, the student's account will be financially encumbered, with the same penalties and restrictions as for late payment enumerated above.

***One-Year Prepaid Tuition Plan.*** Undergraduate students paying the set upper limit of tuition may receive a discount for the spring semester if payment is made for the full academic year at the time of fall registration. At the 1988–89 rate, students choosing this plan would pay $10,402 for two semesters instead of $10,508.

***Four-Year Prepaid Tuition Plan.*** New undergraduate students may elect to pay in advance the total tuition for the full four-year program (eight consecutive semesters) at the rate applicable to their first year. Under this plan, the payment for programs beginning with the 1988 fall semester would be $42,032. Refunds to students who do not complete their full four-year programs would be made at the original rate for all remaining full semesters.

***GWU Monthly Payment Plan.*** The University's Monthly Payment Plan is available to all students. Upon receipt of the appropriate application, the University will establish an account and mail payment coupons and envelopes for use to ensure proper credit of payments. The plan covers an academic year (excluding summer sessions) and requires ten monthly payments, May

through February. Payments must be received by the 10th of each month. If a decision is made after May to use this plan, all missed payments must be made to bring the account current to the time participation is initiated. There is no charge and no interest for using the plan if all payments are made as scheduled.

***Commercial Prepaid and Deferred Payment Plans.*** Several commercial programs for parents who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

Mellon Bank Edu-Check Plan, P.O. Box 8888, Wilmington, Del. 19899
Knight Tuition Payment Plans, 53 Beacon Street, Boston, Mass. 02108
School-Chex, Irving Trust Company, 61 Broadway, New York, N.Y. 10007
Educational Loan Program, Consumer Credit Department, The Riggs National Bank, 1120 Vermont Avenue, N.W., Washington, D.C. 20005
The Tuition Plan, Inc., Concord, N.H. 03301
Tuition Line, Maryland National Bank, Consumer Banking Division, P.O. Box 1954, Baltimore, Md. 21203

## Off-Campus Courses

Fees for each semester are due and payable in full at the time of each registration; however, a student registering for a 13-week or longer credit course may sign a deferred payment contract at each registration to make payments in three equal installments—one-third at the time of registration, one-third by October 3, and one-third by November 3 (for the fall semester); one-third at the time of registration, one-third by February 7, and one-third by March 6 (for the spring semester). Payments are due at the stipulated times. Interest at the rate of 8 percent per annum on the unpaid balance will be charged from the beginning of each semester to the date payment is made.

Students receiving partial government tuition assistance, employee benefits, and partial scholarships must pay their portion of the tuition in full at the time of registration.

Except for specified special sessions, tuition and fees for credit courses lasting less than 13 weeks, and for all noncredit courses, are payable in full at registration.

## Withdrawals and Refunds

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the dean of the college, school, or division in which the student is registered. Notification to an instructor is not an acceptable notice (see Withdrawal, page 231). Financial aid recipients must notify the Office of Student Financial Aid in writing.

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters. No refund of the $100 tuition deposit required of entering students is granted.

1. ***Complete withdrawal from the University:***
   Withdrawal dated on or before Friday of the first week of classes....90%
   Withdrawal dated on or before Friday of the third week of classes...75%
   Withdrawal dated on or before Friday of the fifth week of classes....50%
   Withdrawal dated after the fifth week of classes.....None

2. ***Partial withdrawal:*** If the change in program results in a lower tuition charge, the refund schedule above applies to the difference.
3. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.
4. ***Summer sessions:*** In cases of authorized withdrawals from courses, refunds of 75% of tuition and fees will be made for courses dropped within the first seven calendar days following the scheduled registration day. No refund will be made for courses dropped thereafter.
5. ***Refund Schedule for Off-Campus Registration:***

Long Session (or any session longer than 13 weeks)
- Starting date of class plus 6 calendar days ..... 90%
- Starting date of class plus 20 calendar days ..... 75%
- Starting date of class plus 34 calendar days ..... 50%
- Starting date of class plus 35 calendar days to end ..... None

Intermediate Session (9 weeks, 1 day per week)
- Starting date of class plus 6 calendar days ..... 90%
- Starting date of class plus 13 calendar days ..... 75%
- Starting date of class plus 20 calendar days ..... 50%
- Starting date of class plus 21 calendar days to end ..... None

Short Session (7 weeks, 2 days per week)
- Starting date of class plus 2 calendar days ..... 90%
- Starting date of class plus 8 calendar days ..... 75%
- Starting date of class plus 15 calendar days ..... 50%
- Starting date of class plus 16 calendar days to end ..... None

Mini Session (3 weeks)
- Starting date of class plus 1 calendar day ..... 90%
- Starting date of class plus 5 calendar days ..... 75%
- Starting date of class plus 9 calendar days ..... 50%
- Starting date of class plus 10 calendar days to end ..... None

No refund will be made for sessions of less than 21 days.

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Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education. Federal regulations require that financial aid recipients use such refunds to repay financial aid received for that semester's attendance. This policy applies to institutional aid as well.

In no case will tuition be refunded or reduced because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

## Financial Aid

George Washington University offers a program of financial assistance for undergraduate and graduate students. Undergraduate aid consists of two basic types: awards for academic achievement without reference to financial circumstances (honor scholarships) and scholarships, grants, loans, and employment

based on academic achievement and demonstrated financial need. Applicants may apply for only one type of aid: need-based or honor. The program of financial assistance for graduate students includes assistantships, fellowships, traineeships, graduate scholarships, research appointments, part-time employment, and loans. In addition, loans and resident assistantships not based on financial need are available to undergraduates and graduates alike.

In general, consideration for financial aid is restricted to students in good academic standing who meet the minimum grade-point average for particular awards and are not financially encumbered by any other University office. All undergraduate gift aid (institutional scholarships and grants and federal grants) requires that the student be working on the first undergraduate degree. Undergraduate gift aid and all federal aid require that the recipient be registered for a full-time course load at GWU.

Applications for institutional or federal aid cannot be processed if the relevant tax returns have not been filed in accordance with the IRS Code. Documents submitted as part of aid applications become the property of the University and cannot be returned. Federal regulations require that the University report suspected cases of fraud or misrepresentation to the appropriate federal, state, and local authorities.

## Scholarships and Other Forms of Aid for Undergraduates

### Engineering Honor and High Honor Scholarships

These programs were initiated to recognize academically talented students who wish to study at the School of Engineering and Applied Science. The scholarships are awarded on the basis of merit only, and financial need is not a requirement for consideration. They are available to entering freshmen and transfer students who meet the criteria given below and are U.S. citizens or permanent residents.

The Evelyn Elder and Lloyd Hartman Elliott Engineering Honor Scholarships (EHS), so designated upon the retirement of the former president after 23 years of service to the University, cover one-half the tuition costs of attending SEAS. Engineering High Honor Scholarships (EHHS) cover full tuition. Both may be renewed through completion of the undergraduate degree, provided the recipient is enrolled full time in an engineering curriculum and scholarship criteria are met, with the option of an additional year if the student wishes to pursue graduate study at the master's level. A minimum quality-point index of 3.0 in 15 or more credit hours per semester is needed to retain the EHS, and a minimum quality-point index of 3.3 in 15 or more credit hours per semester is needed to retain the EHHS. Applicants with financial need should apply for need-based aid, not for these scholarships.

All undergraduate students must file applications and supporting credentials for financial aid by March 1 preceding the academic year of the award for the fall semester; by November 1 for the spring semester; and by April 1 for the summer sessions.* A student must reapply for the EHS or EHHS each year.

* Only students who are enrolled in this University for at least 6 semester hours in the immediately preceding spring semester or who have applied for financial aid for the following fall semester are eligible for consideration for summer sessions financial aid, provided that they will graduate at the end of that summer or the following fall semester or are required by their program to attend the summer sessions.

## Criteria for Engineering Honor Scholarships

### *Entering Freshmen*

The student must have

1. a minimum combined SAT score of 1250 or better or, if the SAT will not be taken, an average ACT score of 30 or better in the verbal, mathematics, and natural science sections or a combined PSAT score of 125 or better;
2. a cumulative rank at the end of the junior year in the upper 10% of the class over a period of three years or more; and
3. a grade average of 85% or better at the end of the junior year in mathematics and science courses taken during the previous three years.

### *Transfer Students*

The student must have

1. completed (or be completing by the end of the present semester) 30 semester hours at an accredited community college, college, or university;
2. completed at least 6 semester hours of college calculus or higher mathematics and at least 3 semester hours of college-level physics or chemistry; and
3. achieved an overall grade average of at least 85% (3.4) and a combined average of 80% (3.2) in college-level mathematics and science courses.

## Criteria for Engineering High Honor Scholarships

### *Entering Freshmen*

The student must have

1. a minimum combined SAT score of 1450 or better or, if the SAT will not be taken, an average ACT score of 34 or better in the verbal, mathematics, and natural science sections or a combined PSAT score of 145 or better;
2. a cumulative rank at the end of the junior year in the upper 5% of the class over a period of three years or more; and
3. a grade average of 92% or better at the end of the junior year in mathematics and science courses taken during the previous three years.

### *Transfer Students*

The student must have

1. completed (or be completing by the end of the present semester) 30 semester hours at an accredited community college, college, or university;
2. completed at least 6 semester hours of college calculus or higher mathematics and at least 3 semester hours of college-level physics or chemistry; and
3. achieved an overall grade average of at least 90% (3.6) and a combined average of 85% (3.4) in college-level mathematics and science courses.

## Need-Based Financial Aid

The University offers extensive programs of scholarships, grants, loans, and employment based on demonstrated need. The University participates in the Perkins Loan, Pell Grant, Supplemental Educational Opportunity Grant, and the College Work–Study programs.

All undergraduate students must file applications and supporting credentials for financial aid by March 1 preceding the academic year of the award for the fall semester; by November 1 for the spring semester; and by April 1 for the summer sessions.* A student must reapply for financial aid, including scholarships, each year; renewal is conti. gent upon funds being available when the student completes the application.

Complete information concerning financial assistance is contained in the student financial aid pamphlet, which is available from the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

## Scholarships and Grants

Scholarships are awarded for the academic year unless otherwise specified and are credited in equal parts for each semester. Each holder must carry at least 15 semester hours per semester in subjects related to the degree program during the period for which the scholarship is awarded. Most of the following scholarships are limited to students in the School of Engineering and Applied Science. The University also offers other scholarships that are open to engineering students.

***American Association of Cost Engineers Scholarship (1977).*** Established by the American Association of Cost Engineers for scholarship assistance to a full-time student, graduate or undergraduate, majoring in a curriculum that includes courses related to cost engineering.

***Atlantic Research Corporation Scholarship (1979).*** Established by the Atlantic Research Corporation for graduate and undergraduate students. The undergraduate scholarship includes full tuition, books, and fees for a student in the senior year only. Graduate students receive full tuition, books, and fees for one year of full-time graduate work. Recipients of the award must have an overall *B* average and must agree to accept employment with Atlantic Research Corporation for one year after graduation. Awards are offered on both a financial-need and a non-financial-need basis. See manager of engineering admissions for further details.

***Frederick Albert and Alma Hand Britten Scholarships (1959).*** Bequest of Alma Hand Britten for scholarship assistance to students entering the School of Engineering and Applied Science who would not otherwise be able to pursue such professional study. Also available for graduate study.

***Henry Harding Carter Scholarship (1896).*** Established by Maria M. Carter in memory of her husband to aid a deserving student who is preparing for the civil engineering profession. Available to students working toward the degree of Bachelor of Science (Civil Engineering).

* Only students who are enrolled in this University for at least 6 semester hours in the immediately preceding spring semester or who have applied for financial aid for the following fall semester are eligible for consideration for summer sessions financial aid, provided that they will graduate at the end of that summer or the following fall semester or are required by their program to attend the summer sessions.

***Henry Parsons Erwin Scholarship (1955).*** Established by Helen B. Erwin as a memorial to her husband, a former Trustee of the University. A partial scholarship for a student in engineering and applied science.

***George Washington University Board of Trustees Scholarships.*** Full- and partial-tuition scholarships that begin in the fall semester and may be renewed through the senior year, provided the holder reapplies by the published deadlines, maintains a *B* average, and continues to be in financial need. Candidates must plan to select a curriculum leading to a bachelor's degree.

***Louis E. Giles Memorial Scholarships (1966).*** Bequest of Susie E. Giles in honor and memory of her husband for scholarships to students in the School of Engineering and Applied Science who need financial assistance. Also available to graduate students.

***The George Hyman Construction Company Scholarships (1974).*** Established by the George Hyman Construction Company to aid deserving students preparing for the civil engineering profession. These partial-tuition scholarships begin in the fall semester and may be renewed through the senior year, provided the holder reapplies by the published deadlines, maintains a *B* average based on a full course load leading to a degree in civil engineering, and continues to be in financial need.

## Scholarships, Fellowships, Assistantships, and Other Forms of Aid for Graduate Students

Application and correspondence concerning assistantships, fellowships, traineeships, or graduate scholarships should be sent directly to the department concerned and addressed to George Washington University, Washington, D.C. 20052. Unless otherwise specified, application and supporting credentials should be submitted no later than February 1 preceding the academic year for which the award is made. Application for admission to graduate study is a prerequisite for consideration.

### Graduate Scholarships and Fellowships

***Abdelfattah Abdalla Award (1984).*** Established in memory of Professor Abdelfattah Abdalla (1937–1984). Dr. Abdalla served his profession as a professor and as chair of the Department of Electrical Engineering and Computer Science. The award is based on academic merit and is made to an incoming full-time graduate student in the Department of Electrical Engineering and Computer Science. Minimum academic criteria for the award are the same as for the Graduate Engineering Honors Fellowship (see below). The award consists of one-half tuition and a $6,000 stipend for an academic year and is renewable.

***Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholarship.*** For outstanding students in the fields of science, engineering, and medicine.

***American Association of Cost Engineers Scholarship (1977).*** See page 223.

***Atlantic Research Corporation Scholarship (1979).*** See page 223.

***Frederick Albert and Alma Hand Britten Scholarships (1959).*** See page 223.

***Louis E. Giles Memorial Scholarships (1966).*** See above.

***Graduate Engineering Honors Fellowship (GEHF) Program.*** Established to recognize students who have achieved academic excellence and are interested in starting or furthering graduate work. Students selected for the GEHF Program receive a half-tuition scholarship for the first year of graduate study, which may be renewed for (a) one additional year for master's and professional degree students or (b) two additional years for doctoral students, provided that a minimum 3.4 cumulative quality-point index is maintained while a full-time student. One grade of *F*, regardless of cumulative quality-point index, disqualifies the recipient from further scholarship assistance.

To be considered for the GEHF Program a student must (1) be a U.S. citizen or a permanent resident of the United States, (2) meet current School of Engineering and Applied Science requirements for admission to the appropriate program, (3) have attained approximately a 3.5 grade-point average in the prior degree from an accredited college or university (consideration is given to the content of programs completed and the academic reputation of all postsecondary institutions at which study was undertaken), and (4) provide three letters of recommendation from professors in the previous academic program. Selection is made by the dean of the School of Engineering and Applied Science. A limited number of these fellowships are available each year. Students in the GEHF Program must take at least 9 credit hours at the graduate level per semester, in the degree program in which they have been accepted. At least three months prior to the semester in which they wish to begin study, students should submit applications, transcripts, and letters of recommendation to the appropriate department chair, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052.

***National Science Foundation Graduate Fellowships.*** Fellowships providing tuition, fees, and stipends to students in programs leading to graduate degrees in the mathematical, physical, medical, biological, engineering, and social sciences and in the history and philosophy of science. Open to students who have been admitted to a graduate program and who have completed less than one calendar year of graduate study. Applications should be made to the Fellowship Office, National Research Council, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.

***Phi Delta Gamma Scholarship Endowment Fund (1968).*** Established by the Beta Chapter of Phi Delta Gamma (national fraternity for graduate women) for women graduate students.

## Assistantships

***Research Assistantships.*** Available to graduate students in SEAS programs. Research assistants are expected to work 20 hours per week conducting research in support of an established research program. Stipends range up to $12,000, depending on the status of the student and the length of the appointment (9 to 12 months). In addition, selected recipients may be awarded tuition assistance. Further information and applications are available in department offices.

***Research Scholar Assistantships, GWU/NASA–Langley Program.*** See page 41.

***Teaching Assistantships.*** Awarded to qualified graduate students in the School on the basis of academic criteria established by the respective departments. Teaching assistants receive financial compensation of $900 to $3,000 per course and tuition for a maximum of 9 credit hours for the semester in

which they teach. Further information and applications are available in department offices.

## Industrial Liaison Program Awards

The Industrial Liaison Program (ILP) has been established to develop closer cooperation and communication between the Department of Electrical Engineering and Computer Science, its Institute for Information Science and Technology, and companies that depend upon the technological foundations represented by the department. A steering committee of Washington area industrial leaders has provided important guidance in founding the program, which is structured to meet the needs of both the department and industry. The ILP offers the following awards.

***Abdelfattah Abdalla Award.*** See Graduate Scholarships and Fellowships, above.

***ILP Corporate Graduate Student Fellowship.*** Awards sponsored by E-Systems, Inc., MELPAR Division and Laboratoire Central de Telecommunications for entering graduate students. The award consists of tuition for 9 credit hours per semester and a $7,500 annual stipend. The award is renewable if the student's academic performance meets the requirements of the department and funds are available. Applicants must have a minimum grade-point average of 3.5 (on a 4.0 scale) in course work leading to their previous degree and must be U.S. citizens or permanent residents.

***ILP Distinguished Graduate Teaching Assistantship.*** Additional cash awards of $4,000 offered to outstanding first-year students who are selected as graduate teaching assistants. Applicants must have a minimum grade-point average of 3.5 and demonstrate excellent command of the English language. Previous teaching experience is preferred. The teaching assistantship (providing tuition for 9 credit hours per semester and financial compensation of $2,000 or $6,000 for the academic year) is renewable if the student meets scholarship requirements and performs satisfactorily as an instructor; the $4,000 ILP cash award is not renewable. Recipients are encouraged to apply for a research assistantship with a faculty member upon completion of their first year of study.

***ILP Graduate Research Assistant Matching Grant.*** The Industrial Liaison Program will provide grants of up to $5,000 to match awards from the School, to a maximum total of $10,000 per student for the academic year. Students work with a faculty member on a research project.

***ILP Supplement to the Graduate Engineering Honors Fellowship Program.*** Research fellowships awarded to select first-year students who are recipients of the GEHF. The award consists of $6,000. Fellowship recipients work with a faculty member on a research project.

***Richard E. Merwin Memorial Award.*** Awarded annually to an oustanding doctoral student in the Department of Electrical Engineering and Computer Science. Dr. Merwin (1922–1981) served his profession as a research professor in the department, as president of the IEEE Computer Society, and as editor of *IEEE Transactions on Computers* and worked on ENIAC, this country's first electronic computer. The award is $3,000 for one year and is made to a full-time D.Sc. student, based on academic merit. Recipients are not eligible for an additional award.

## Other Government- and Industry-Sponsored Fellowships

From time to time, individual companies have sponsored graduate fellowships in specific fields of interest. Some recent examples are the following.

***Association of American Railroads Fellowship Grant.*** Awarded to the Institute for Reliability and Risk Analysis, for graduate education and research in engineering, operations research, economics, and statistics with special emphasis on reliability, failure data analysis, risk analysis, and statistical methodology. Recipients must work 20 hours per week during the academic year and full time during the summer. The grant provides tuition for up to 9 credit hours per semester and 3 credit hours during the summer, along with a subsistence allowance.

***National Bureau of Standards.*** Awarded to two graduate students in the fields of robotics, computer graphics, industrial automation, or computer-integrated manufacturing. Recipients must work 20 hours per week during the academic year and full time during the summer and receive a stipend of $12,000 per year. Students must meet the minimum requirements for the Graduate Engineering Honors Fellowship to be considered.

## Other Sponsored Awards for Graduate Study

Information regarding awards sponsored by foundations, professional and learned societies, corporations, and others that may be used in support of graduate study is available on the first floor of the Gelman Library. Information is also available on such programs as the Rhodes, Marshall, National Science Foundation, Fulbright, and Luce as well as many others.

# Forms of Aid Available to Undergraduate and Graduate Students

## Resident Assistantships

Resident assistantships are available to graduate students and seniors in any field of study who are interested in working with the student personnel program in University residence halls. Specific duties vary with the position, but basically consist of counseling, advising student groups, and administration. Remuneration includes partial tuition and a furnished room for the academic year. All positions are part time, and staff members are required to enroll as full-time students in degree programs. Further information may be obtained from the Office of the Director of Housing and Residence Life.

## Loan Funds

The following loan funds are available to undergraduate and graduate students. A separate application must be submitted for all loan programs. Applications for the Perkins Loan Program should be filed no later than March 1 (all undergraduates) or April 1 (graduate students) for the following academic year. Complete information is contained in the student financial aid

pamphlet, which is available from the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

***George F. Henigan Loan Fund (1975)***
***International Student Loan Fund (1967)***
***Joanne Jacobs Student Loan Fund (1974)***
***Jessie B. Martin Loan Fund (1967)***
***Perkins Loan Program***
***University Student Emergency Loan Fund***

***John Brewster Willis, Jr., Loan Fund in Mechanical Engineering.*** Established by Mrs. William L. Lane as a memorial to her nephew, John Brewster Willis, Jr. Available to mechanical engineering students (graduate or undergraduate) who are primarily interested in aeronautics.

***Guaranteed Student Loan Program.*** George Washington University is an eligible participant in the Guaranteed Student Loan Program. Freshman and sophomores may apply for a maximum of $2,625 per year; juniors and seniors, a maximum of $4,000 per year. Graduate students may apply for a maximum of $7,500 per year. Students who intend to use the loan for payment of tuition at registration should submit an application and all required supporting documents no later than June 1 (fall semester registration), October 1 (spring semester registration), or March 1 (summer registration).

***Parent Loans for Undergraduate Students/Supplemental Loans for Students.*** George Washington University is also an eligible participant in the Parent Loan for Undergraduate Students (PLUS) and Supplemental Loans for Students (SLS) programs. The interest rate on the loans is variable, based on the interest rate of U.S. Treasury bills, to a maximum of 12 percent. Repayment begins 60 days after the disbursement of the check. Parents of dependent undergraduate and graduate students may apply for up to $4,000 per year for each student. Independent undergraduate and graduate students may apply for up to $4,000 per year on their own behalf. Students who intend to use the loan for payment of tuition at registration should submit an application no later than June 1 (fall semester registration), October 1 (spring semester registration), or March 1 (summer registration).

***CONSERN Loan Program.*** This program, jointly sponsored by the District of Columbia and the Consortium of Universities of the Washington Metropolitan Area, provides supplementary aid to creditworthy students and parents who have financial need remaining after having exhausted benefits from all other federal, state, and institutional aid programs for which they qualify (except the College Work–Study Program and PLUS/SLS). Applicants must be enrolled at least half time and must demonstrate financial need otherwise unmet. CONSERN loans range from $2,000 to the full certified cost of attendance per academic year and carry a variable interest rate, initially 9 percent. Since this program will end in late November 1988, applications for CONSERN loans must be submitted by November 1.

## Student Employment

The University participates in the College Work–Study Program. Inquiries should be addressed to the Office of Student Financial Aid. In addition, the Career Services Center maintains a registry of both full-time and part-time positions available in the Washington area for undergraduate and graduate students.

After registration students may apply at the Career Services Center for interviews and referrals to positions for which they are qualified.

## International Students

Undergraduate international students with proven financial need who have completed one semester of full-time work (15 hours) at this University with a *B* average are eligible to apply for the Board of Trustees Scholarships; those with a *C* average are eligible to apply for GWU Grants. Aid is awarded in the spring for the following academic year. See Need-Based Financial Aid, page 223.

Limited awards for graduate teaching assistantships and University fellowships are the responsibility of the chair of the department or dean of the school in which the degree is to be earned.

International students applying for graduate teaching assistantships must have minimum scores of 570 on the Test of English as a Foreign Language (55 in listening comprehension) and 250 on the Test of Spoken English. International students applying from outside the University may be appointed to graduate teaching assistantships but must attend a five-day orientation and evaluation program held the week prior to registration. Those found to have difficulties with English will be required to enroll in specified courses in English as a Foreign Language (tuition fees for these courses will be waived) and will be assigned nonteaching duties in place of classroom instruction. Such students will be reevaluated each semester; if they are not designated as qualified to give classroom instruction by the end of one academic year, the teaching assistantship will be withdrawn.

Graduate students who are presently enrolled at GWU and have been proposed as candidates for graduate teaching assistantships by their departments must pass the Test of English as a Foreign Language at the levels indicated above and will be required to complete successfully the English for International Students oral interview and the orientation and evaluation program before they will be considered for graduate teaching assistantships.

For further information on requirements for international teaching assistants, contact the office of the Assistant Vice President for Academic Affairs, Rice Hall, fifth floor, George Washington University, Washington, D.C. 20052.

Long-term loan funds for undergraduate and graduate international students are limited in amount and are available only to those foreign-born persons who have established resident status in the United States through the Immigration and Naturalization Service.

Students who wish to study in the United States should have available sufficient funds to cover expenses for one full year before attempting to enter a college or university. The cost at this University for one academic year (September–May) is at a minimum approximately $17,300. This estimate includes room and board, tuition, books, clothes, and incidental expenses; no travel, holiday, or medical expenses are included.

## Veterans Benefits

The Veterans Benefits office, located on the third floor of Rice Hall, 2121 Eye Street, N.W., assists students entitled to educational benefits as active-duty personnel, veterans, or widows or children of deceased or totally disabled veterans with any problems that may arise concerning their benefits. This office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as active-duty personnel, veterans, or dependents of veterans should consult with the veterans counselor

prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and includes other information of general interest.

The Veterans Administration is at 941 North Capitol Street, N.E., Washington, D.C. 20421.

## Prizes

***Abdelfattah Abdalla Prize.*** Established as a memorial by the many friends and colleagues of Professor Abdalla and awarded annually to an electrical engineering or computer science junior or senior for scholarship and service to Eta Kappa Nu, IEEE, Tau Beta Pi, or the Department of Electrical Engineering and Computer Science. The recipient must have a quality-point index of at least 3.5. Selection is made by Eta Kappa Nu. The student receives a cash award, and his or her name is engraved on a plaque displayed in Tompkins Hall. The award is presented at the Dean's Honors Reception held during the spring semester.

***Norman B. Ames Memorial Award.*** Established by many friends of Professor Ames and awarded annually to a graduating senior of the School of Engineering and Applied Science who is nominated by fellow students as having made significant contributions to the students in the School of Engineering and Applied Science, to the School, and to the University. The student receives a cash award, which is presented at the Annual Commencement in May.

***Martin Mahler Prize in Materials Testing.*** A one-year membership in the American Society for Testing Materials awarded to the upper-division or graduate student in engineering who submits the best reports on tests in the materials laboratory course, with preference given to prestressed concrete tests. The award is presented at the Annual Commencement in May.

***Alfred Martin Freudenthal Prize.*** Established as a memorial to Professor Freudenthal by his wife, friends, students, and colleagues for his outstanding contributions to engineering education and awarded annually to the senior who graduates with the highest scholastic standing. To be eligible for this prize, the student must have completed at GWU at least one-half the work required for his or her degree. The student receives a cash award, and his or her name is engraved on a plaque displayed in Tompkins Hall. The award is presented at the Dean's Honors Reception held during the spring semester.

***Tau Beta Pi Outstanding Sophomore Award.*** Established by the GWU Chapter of Tau Beta Pi and awarded annually to the student who ranks first in his or her class at the completion of the sophomore year. The award consists of a medal, and the recipient's name is engraved on a plaque displayed in Tompkins Hall. The award is presented at the Dean's Honors Reception held during the spring semester.

## Regulations

A student enrolled in the School of Engineering and Applied Science is required to conform to the following regulations.

A student who withdraws, is suspended, or for any other reason is not registered at the University for one semester or more may reenter and continue work only under the regulations and requirements in force at the time of return.

If a student knowingly makes a false statement or conceals material information on an application for admission, registration form, or any other University document, the student's registration may be canceled. If such falsification is discovered after the student has matriculated at the University, the student may be subject to dismissal from the University. Such a student will be ineligible (except by special action of the faculty) for subsequent registration in the University

## Student Conduct

All students, upon enrolling and while attending the George Washington University, are subject to the provisions of the *Statement of Student Rights and Responsibilities*, which outlines student freedoms and responsibilities of conduct, the Judicial System for Nonacademic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained from the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University, which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

## Academic Dishonesty

The University community, in order to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and will be held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are legal, moral, and intellectual offenses against the community and will be prosecuted through the proper University channels.

Copies of the University policy on academic dishonesty can be obtained from the following officers: all department chairs, all academic deans, the registrar, and the vice president for academic affairs.

## Withdrawal

Applications for withdrawal from the University or for changes in class schedule must be made on a program adjustment form. The signatures of the course instructor(s), student's adviser, department chair, and, where appropriate, the international student services adviser must be obtained on the form

prior to receiving the dean's approval. Financial aid recipients must notify the Office of Student Financial Aid in writing.

All charges for courses from which the student withdraws are subject to the refund policy listed under Fees and Financial Regulations. Unauthorized withdrawal will result in the recording of a grade of *Z* for the course or courses.

Permission to withdraw from the University will not be granted to a student who does not have a clear financial record.

A student who withdraws or is otherwise absent from the University for one semester or more must apply for readmission. If readmitted, the student continues work under the requirements and regulations in force at the time of readmission.

## Changes in Program of Study

A student may not make any changes in an approved program of study without the consent of the faculty adviser, instructor, international student services adviser (when appropriate), and the associate dean. Requests for changes in class registration must be made on a program adjustment form, available in the SEAS Admissions and Registration Office (see Withdrawal, above).

### *Adding Courses*

During the first 14 days of the semester, courses may be added to the student's program by submitting a program adjustment form with the necessary signatures.

### *Dropping Courses*

***Regular Drop.*** Courses may be dropped without academic penalty during the first 28 days of the semester by submitting a program adjustment form with the necessary signatures.

***Late Drop.*** Permission to drop a course without academic penalty after the 28th day of a semester may be granted with the approval of the instructor, the student's adviser, the chair of the department in which the student is enrolled, and the associate dean. Requests for late drops must be submitted to the associate dean's office on the appropriate late-drop form and must be accompanied by a program adjustment form and certification of sickness or injury, if such is the cause of the late withdrawal. A late drop may be granted only under both of the following conditions:

1. It is necessary because of exceptional circumstances, such as certified medical absence or forced absence caused by work-related requirements.
2. The grades in all courses involved are *C* or better for graduate students and *D* or better for undergraduate students as of the date of the request.

In all cases, financial regulations governing withdrawal remain in full effect.

### *Change in Course Status*

The status of a course may not be changed from credit to audit or vice versa after the 28th day of the semester.

## Credit

Credit is given only after registration for a course and satisfactory completion of the required work or upon the granting of advanced standing.

***Auditing.*** A person who has been admitted to the University may be registered, with the permission of the instructor, as an auditor in a class (no academic credit). An auditor is not required to take active part or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit. Tuition is charged at the prevailing rate.

***Balance Sheet.*** On request, the School's Admissions and Registration Office will issue to undergraduate degree candidates a balance sheet showing the amount of work completed and the requirements remaining to be met for the degree. A second balance sheet is issued only if the student changes major or degree objectives. It is recommended that a balance sheet be requested at the end of the junior year.

***Postadmission Transfer Credit.*** A student who plans to attend another institution not in the Consortium and apply credit so earned toward graduation from this University must first secure the written approval of the adviser, the department chair, and the associate dean on a form available in Tompkins Hall, Room 103. Students wishing to take courses in Consortium schools should complete this form and follow the procedures outlined on page 216. In no event will credit in excess of what might be earned in a similar period in this University be recognized.

## Transcripts of Record

Official transcripts of student records are issued on written request of the student or former student who has paid all charges, including any student loan installments, due the University at the time of the request. A fee of $2 is charged for each transcript. Partial transcripts are not issued.

## Graduation Requirements

Degrees are conferred in February, May, and September.

To be recommended by the faculty for graduation, a student must have met the admission requirements of the School; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which he or she is registered; filed an application for graduation prior to the published deadline date; and be free from all indebtedness to the University. Enrollment is required for the semester or summer session at the close of which the degree is to be conferred.

***Application for Graduation.*** Applications for graduation must be filed by October 1 for the February convocation, February 1 for May convocation, and July 1 for September graduation. (Students who complete degree requirements during the summer sessions will be awarded diplomas dated September 30, although there is no formal convocation at this time.)

***Student Records.*** Information on the status of credit, transfer-of-credit awards, balance sheets, and other information relating to graduation may be obtained in Tompkins Hall, Room 103.

***Area of Concentration Certificate.*** Upon successful completion of the master's or doctoral degree, the student may obtain a certificate indicating the area of concentration by submitting a written request to the appropriate department chair.

## The Library

All students registered in the University have the privilege of using the University's Gelman Library. Its stacks are open, and all students are welcome

to browse. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

The loan period for stack books is 21 days. Any book that circulates is subject to recall by the library if needed for reserve or other use. Reserve books must be used in the reserve reading room when the library is open; they may be withdrawn for overnight use beginning at 8:30 p.m. Transcripts of grades are withheld until a student's library record is clear, with all borrowed books returned and any fines paid.

All students using the Gelman Library are expected to be familiar with its detailed regulations, available at any of the library's service desks.

## University Policy on the Release of Student Information

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions that are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive students' written consent before releasing information from their education records to persons outside the University, except as provided by the Act and except for directory information as indicated below (information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency); and
4. comply with a judicial order or a lawfully issued subpoena to release a student's record, notifying the student of such action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height, weight, and age of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar at the beginning of each semester or session of enrollment.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

## Right to Dismiss Students

The right is reserved by the University to dismiss or exclude any student from the University, or from any class or classes, whenever, in the interest of the student or the University, the University administration deems it advisable.

## Right to Change Rules

The University and its college, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

### Right to Make Changes in Programs

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

### Property Responsibility

The University is not responsible for the loss of personal property. A Lost and Found Office is maintained on campus in the Safety and Security Office.

### University Policy on Drugs

The University cannot condone violations of law, including violations of those laws that proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken to protect the interests of the University and the rights of others.

## Associations and Services

### Consortium of Universities of the Washington Metropolitan Area, Inc.

Ten universities in the Washington area (American University, Catholic University of America, Gallaudet University, George Mason University, George Washington University, Georgetown University, Howard University, Marymount University, the University of the District of Columbia, and the University of Maryland) are associated in a Consortium through which they coordinate the use of their respective facilities; Mount Vernon College and Trinity College are associate members of the Consortium. Students in approved programs leading to degrees in any one of these institutions have the opportunity to select from the combined offerings of all of the members the particular courses that best meet their needs. This privilege is subject to the regulations of the school or division in which the student is enrolled.

Participation is limited to degree candidates. The following, however, are excluded: students in canon law, dentistry, medicine, nursing, and theology. Law students are also excluded from participation, except for candidates for the degree of Master of Laws at George Washington University and Georgetown University.

In special courses involving private instruction (as in music or art) or tutorial study, if a special fee is charged, this fee is not covered by the Consortium agreement and must be paid by the individual student to the institution administering the course.

Students are encouraged to study the program announcements of all participating institutions. See page 216 for more information concerning registration for Consortium courses.

Registration forms and instructions are available from the registrar and in Tompkins Hall, Room 103. Students register and pay tuition at their own institutions for all Consortium courses; course fees are payable to the visited institutions.

## University Computer Center

The University Computer Center is in the Academic Center, 801 22nd Street, N.W. The center is normally open 24 hours a day, seven days a week, during the academic semesters; the user area may not be open nights during the winter and summer breaks.

The center provides computational facilities, consultation, and operational assistance as required. It operates two IBM 4381 computers (VM/VS1/CMS). Public terminals and dial-in lines are available for academic users. There is a full range of compilers and application software packages.

In addition to the central facility, computer services and facilities are available in several of the schools; microcomputers are widely available as well. The University's GW Data Network ties together the mainframes and many of the microcomputers, and the University computers are connected to the national computer networks BITNET and SURANET.

## Computer Information and Resource Center

The Computer Information and Resource Center/User Services (CIRC/US) is the primary source of information and consultation on the use of computers and computer networks at the University. CIRC/US publishes a periodic newsletter on computing issues, gives seminars, and offers technical advice to faculty and students regarding access to and use of the IBM mainframe and microcomputers, the GW Data Network, and microcomputer selection and acquisition. CIRC/US is responsible for distribution of a number of site-licensed microcomputer software packages and administers and can make recommendations on various discount-purchase programs for microcomputer equipment.

Computer programming courses are offered by the School of Government and Business Administration, the Department of Statistics/Computer and Information Systems, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

Any University student may have access to the computer facilities for individual research, class projects, and thesis or dissertation study. Access is by request; the schedule of charges is available at CIRC/US.

## The Speech and Hearing Center

The George Washington University Speech and Hearing Center provides diagnosis and treatment of a wide range of speech, language, and hearing disorders. These include developmental impairments of articulation and language, stuttering, voice disorders, and speech and language impairments resulting from neurological damage. Evaluation and aural rehabilitation are also provided for hearing-impaired individuals. The Speech and Hearing Center operates in conjunction with the Department of Speech and Hearing.

## Reading Center

The Reading Center offers individual diagnostic and corrective services for all levels: primary, elementary, secondary, and adult. Special reading improvement classes are conducted for high school and college students as well as other adults. There is also an After-School Program designed for academically gifted

children. Instruction is available on an individual, semi-individual, and small-group basis.

A complete diagnosis includes psychological tests; vision, hearing, dominance, and spelling tests; and various types of reading achievement and aptitude tests. Results are interpreted, and a written report is presented in conference with the parents or the individual.

The special reading improvement classes for high school students, college students, and other adults are offered throughout the year at stated intervals. Emphasis is placed on improvement of vocabulary, speed, comprehension, and study skills. Instruction in spelling is also provided as needed.

***Fees.*** Individuals should contact the center regarding the fee schedule. All fees are payable in advance.

## The Writing Center

The Writing Center offers informal and personal writing instruction; its services are provided free to all GWU students. Students at all levels of experience and expertise are encouraged to use the center for help in identifying writing problems and learning how best to express ideas. Trained tutors (undergraduate peer tutors, graduate students, the director, and other members of the faculty) work with students individually on areas of specific need or interest. Tutors can provide assistance in such areas as organizing a mass of information efficiently and clearly, using correct grammar and punctuation, getting started on a writing project, developing a thesis, providing evidence in support of an argument, and presenting the findings of an experiment or the solution to a research problem.

## GW Television

The main television resource of the University is GWTV, a state-of-the-art ITFS, multichannel broadcast facility. Goals of GWTV are to develop courses and programs in cooperation with academic departments for broadcast off campus; to develop videotapes for class use and for continuing professional education; to expand a program of national and international teleconferences, and to manage the acquisition and maintenance of television equipment and facilities in various instructional units.

Operating from studios located in the Academic Center, GWTV has the capability to receive from and transmit to any communications satellite. Video teleconference programs are delivered to a number of on-campus locations, such as studios, conference rooms, and auditoriums, where participants can interact by telephone link with the originating site.

## ROTC

George Washington University students may enroll through the Consortium in the Army ROTC program offered at Georgetown University, the AFROTC program at the University of Maryland, or the Army ROTC or AFROTC at Howard University. Those interested should contact the ROTC enrollment officer at one of these universities. Limited credit for such courses (primarily advanced ROTC) may be assigned for electives to meet degree requirements at George Washington University; prior approval is required by the dean of the school in which the student is enrolled.

For information on the Naval Reserve Officers Training Corps Program at George Washington University, see page 46.

## Alumni Associations

### *General Alumni Association*

The objectives of this association are to unite graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes and to promote the general welfare of the University.

Membership in the association is conveyed automatically to anyone who has graduated from any school or division of the University. Anyone who has earned 15 credit hours or the equivalent at the University, who has left the University in good standing, and whose class has graduated is eligible for membership. For Division of Continuing Education students, however, only the "15 credit hours earned" requirement and not the "graduation of the class" requirement applies. Graduates of CCEW certificate programs are also eligible.

The activities of the association are directed by a Governing Board, composed of members representing the constituent alumni of the University's schools and colleges. The voluntary leadership of the association works closely with the staff of the Alumni Relations Office in carrying out association affairs. The association may be contacted through the Alumni Relations Office.

Alumni are encouraged to inquire about available services and programs at the Alumni Relations Office and to keep the office informed of any changes in address or occupation. The office is located in Alumni House, 714 21st Street, N.W., George Washington University, Washington, D.C. 20052.

### *Engineer Alumni Association*

The Engineer Alumni Association of the George Washington University was organized in 1936 and incorporated in 1963 to coordinate with the General Alumni Association those activities of primary interest to engineering alumni. The objectives of the association are to provide a link between graduates and faculty of the School, to help promote the general welfare of the School of Engineering and Applied Science and of the University, to foster activities of the engineering organizations recognized by the University, and to advance the engineering profession in general.

In 1966 a board of directors, comprised of 15 members elected from the association and the engineers' representatives on the Governing Board of the General Alumni Association, was established. The membership of the board of directors was expanded in 1969 to include the Director of Alumni Relations and one representative each from the faculty of the School and the student body. Those directors chosen by the association are elected each year, prior to the June meeting, to three-year terms. Current board members are listed below.

| *Term Expiring 1988* | *Term Expiring 1989* | *Term Expiring 1990* |
|---|---|---|
| Richard Hu | Leslie A. Grant | Arthur L. Howard |
| William H. Huf | Gregg D. Hagedorn | Nahid Khozeimeh |
| Zamir Iqbal | Tewolde A. Iyob | Jeffrey Meeker |
| Jay Mendelbaum | Marshall A. Levitan | Frank Moy |
| Michael Whitley | John D. Scott, Jr. | James A. Sinsabaugh |

***General Alumni Association Representatives***
Pastor Farinas
Issa Khozeimeh
John R. Manning

***General Alumni Association Members-at-Large***
Mary O. Jones
Eric S. Mendelsohn

***General Alumni Association Faculty Representative***
Douglas L. Jones

***Student Representatives***
Ilyas Anjum
Ibrahim Hassan

***Faculty Representative***
Galip M. Arkilic

At the June meeting each year, the board elects officers for its operation during the upcoming year. Following are the officers for 1987–88:

*President:* Nahid Khozeimeh, M.S. 1976; 7005 Milwood Road, Bethesda, Maryland 20817
*Vice President:* Jay Mandelbaum, D.Sc. 1982; 16728 Sioux Lane, Gaithersburg, Maryland 20878
*Secretary:* John D. Scott, Jr., M.E.A. 1981; 7602 Ingle Place, Springfield, Virginia 22151
*Treasurer:* Gregg D. Hagedorn, M.E.A. 1977; 1124 Allison Street, Alexandria, Virginia 22302

# Student Life

The Office of the Vice President for Student Affairs develops student life services, policies, and procedures to complement the University's formal instruction program. These activities are implemented through the offices of the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educational Opportunity Program, Housing and Residence Life, International Student Services, Disabled Student Services, Student Activities, Career Services Center, and Student Health Service.

## Office of the Dean of Students

The Office of the Dean of Students provides counseling and information for students, administers the nonacademic student disciplinary system, and assists in program development for the Division of Student Affairs. Staff members are well informed on University policies and the various student services provided on campus, enabling them to provide referrals and answers to many questions concerning general student life. Personal letters of recommendation for students applying to graduate and professional schools can be obtained from this office. The dean of students is responsible for the services and programs offered by Judicial Affairs, the Counseling Center, Educational Opportunity Program, International Student Services, Disabled Student Services, Student Health Service, and Career Services Center.

### Counseling Center

The Counseling Center fosters personal growth and development and helps individuals with personal, social, career, and study problems that interfere with their educational goals. University students, staff, and faculty are

eligible for services. These include (1) short-term individual counseling, group counseling, art therapy, crisis intervention, and referral services for personal problems (e.g., academic pressures, relationship issues, family problems, concerns about sex, self-esteem); (2) educational/vocational counseling and assessment to assist students in planning their majors and careers; (3) workshops designed to facilitate students' learning about themselves and developing new ways of interacting with others (e.g., assertiveness training, stress management, relationship skills, and study skills seminars); (4) consultation with faculty, staff, and student groups about their special needs in designing programs to improve the campus environment.

The center administers the Miller Analogies Test, GWU admissions tests, and special assessments for business and industry. Its Community Vocational Counseling Services provides career counseling and testing to GWU alumni and the greater Washington community.

Students, staff, and faculty may schedule a cost-free initial interview from 9 a.m. to 5 p.m., Monday through Thursday, and from 1 to 5 p.m. on Fridays. For most services a modest fee per appointment is charged. An additional materials fee is charged for test batteries. Fee adjustments can be made if financial need is a factor. Disabled students are asked to call ahead so that arrangements can be made to adapt services or to meet at an accessible site.

### *Educational Opportunity Program*

The Educational Opportunity Program (EOP) provides selected District of Columbia students with financial aid, academic support services, and personal advising to assist them in pursuing undergraduate work at George Washington University. The EOP staff coordinates a precollege program as well as educational and cultural activities to promote the success and enhance the experience of program participants.

The EOP staff administers the High School/College Internship Program (HI/SCIP), which enrolls highly motivated District of Columbia high school seniors. Participants enroll at GWU as nondegree candidates, taking a maximum of 6 credit hours per semester in addition to their high school curriculum. Application to the HI/SCIP program is made through the student's high school guidance office. Counseling and advising are provided by the EOP staff. HI/SCIP students have access to all of the academic support services available to EOP participants.

### *International Student Services*

International students, scholars, faculty, and staff are provided assistance through International Student Services. The staff offers immigration assistance and information on government requirements and regulations specific to the international community; orientation programs to help with adjustment to living and studying in the United States; and advising and counseling for a variety of personal problems, including cultural adjustment, living conditions, budgets, academic concerns, and financial aid.

### *Disabled Student Services*

The Disabled Student Services office works to assure that the special services necessary for handicapped students to participate fully in their academic programs and the extracurricular life of the campus are provided for them through University or community resources.

### Student Health Service

The Student Health Service is an outpatient clinic staffed by physicians, nurse practitioners, and physician assistants who are capable of addressing most of students' medical problems. Visits are cost-free and may be either arranged by appointment or, during certain hours, secured on a walk-in basis. Many routine laboratory tests may be performed in the Health Service lab at cost. Allergy shots, immunizations, and various lab tests are done at little or no charge. Psychiatric evaluation, crisis intervention, and short-term therapy are available by appointment.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. All fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in off-campus programs and the Continuing Engineering Education Program are not eligible. The bills incurred from all services rendered outside of the Student Health Service (for example, X-ray work, laboratory work, and office visits to private physicians) are the responsibility of the student.

***Health and Accident Insurance.*** The University has arranged for and endorsed group health and accident insurance, on an elective basis, for all students. Interested students should consult the Student Health Service or the Office of the Dean of Students.

### Career Services Center

The Career Services Center provides career planning and job-seeking assistance to students and alumni. Programs and services include full-time and part-time job vacancy listings; career counseling; workshops (e.g., organizing job searches, resume and letter writing, effective interviewing, negotiating for salary); a resource library of career field and employer literature; on-campus interviews for students within one year of graduation; a resume referral service; resume critiques; a call-in job listings service, Jobline; and a credentials service that supports employment and graduate/professional school applications.

## Housing and Residence Life

Complete information concerning the University's residence halls is available from the Director of Housing and Residence Life, George Washington University, Washington, D.C. 20052. Information concerning off-campus housing near the University may also be obtained at this office.

Admission to the University does not include a room reservation. The student will receive, with the notification of acceptance, University residence hall information, an application for residence hall space or apartment accommodation, and a declaration of intent to attend the University. The application for residence hall space or apartment accommodation must be accompanied by a $300 *nonrefundable deposit*. The housing deposit is credited toward the first semester's room or apartment charge. Rooms and apartments are leased for the academic year, and lease payment must be made in early June for the fall semester, unless the student elects the deferred payment plan or the 10-month payment plan. Please check with Housing and Residence Life for the deferred payment plan and with the Student Accounts Office for the 10-month payment plan.

### *1988-89 Residence Hall Rates per Person for Two Semesters**

| | |
|---|---|
| Adams Hall | |
| double room | $3,040 |
| triple room | 2,920 |
| Crawford Hall | |
| double room | 3,040 |
| Everglades Hall | |
| triple room | 3,040 |
| Guthridge Hall | |
| apartment for one person | 3,430 or 3,480 |
| apartment for two persons | 3,380 |
| apartment for three persons | 3,090 |
| Building JJ | |
| apartment for two persons | 3,260 |
| apartment for four persons | 2,920 or 3,260 |
| apartment for six persons | 2,920 |
| Francis Scott Key Hall | |
| apartment for one person | 3,480 |
| apartment for two or three persons | 3,380 |
| Madison Hall | |
| double room | 3,040 |
| triple room | 2,920 |
| Milton Hall† | |
| apartment for two persons | 3,260 |
| apartment for three persons | 3,090 |
| Mitchell Hall | |
| single room | 3,260 |
| Munson Hall† | |
| apartment for two persons | 3,260 |
| apartment for three persons | 3,090 |
| Riverside Towers Hall‡ | |
| apartment for one person | 3,490 or 3,550 |
| apartment for two persons | 3,410 |
| Strong Hall (for women only) | |
| single room | 3,260 |
| double room | 3,040 |
| triple room | 2,920 |
| Thurston Hall | |
| double room, triple room, room for four or five | 3,040 |

### *Food Service§*

Resident freshmen and sophomores are required to choose one of the following food service plans: the any 14 meals per week plan for $2,150 for the academic year; the any 10 meals per week plan at $2,090; or the any 7 meals per week

*Residence hall prices and allocation are subject to change.
†Residents must pay electricity bills (which do not include the cost of heating) in addition to the stated rate.
‡Rates include surcharge for HBO.
§Food service prices are subject to change.

GELMAN LIBRARY, GWU

plan at $2,030 for the academic year. Participation in the food service plans is optional for junior, senior, and graduate students. Food service payment does not cover University intersession or vacation periods. All meal cards admit bearer to the dining room in Thurston Hall and to the second-floor contract dining room in the Cloyd Heck Marvin Center. A small percentage of the meal card may also be used on a cash basis in the Marvin Center first-floor cafeteria, George's, and the Courtyard Cafe at Mitchell Hall.

Students who observe the Jewish dietary laws can write to make arrangements with the George Washington University Housing and Residence Life Office regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

## Cloyd Heck Marvin Center

The Cloyd Heck Marvin Center is the campus community center, offering services and recreational and social opportunities for students, faculty, staff, alumni, and campus guests. Its wide range of facilities includes an information center, dining services, offices to accommodate campus organizations, and conference and meeting rooms. The center also provides the setting for a variety of programs conducted by the University Program Board, by the academic departments that include the performing arts, and by other student and faculty organizations.

The Marvin Center Governing Board, representative of all segments of the University community, plays an important role in the functioning of the center by working closely with the center's staff in the review and development of policies, guidelines, and procedures that direct the operation of the center.

## Religious Life

The University recognizes the contribution that religion makes to the life of its students and encourages them to participate in the various religious organizations of their own choice. Several religious bodies sponsor various groups and form a link between the University and the religious community. The advisers of the religious organizations are available for counseling. Religious services and special observances are also provided for the University community as announced.

## Student Activities Office

The Student Activities Office assists individual students and organizations in program development, campus leadership training, and participation in special projects, both within the University community and the community at large. The office serves as a clearinghouse for activities information, registers and advises student organizations, and informs the University community of activities and programs through monthly and annual publications. The Student Activities Office is also responsible for coordinating the orientation program for new students and for planning supplemental development programs for graduate and undergraduate students. Students who want to participate in the extracurricular phases of University life should acquaint themselves with the facilities and staff of the Student Activities Office.

Additional information about the numerous student organizations and committees is contained in the *Student Handbook*, compiled by and available from the Student Activities Office in the Marvin Center.

### Student Government

The George Washington University Student Association comprises all full-time and part-time graduate, professional, and undergraduate students who are registered for academic credit on campus. A body of elected and appointed individuals is responsible for representing the interests of students at the University. The Student Association provides various services for students, such as an academic evaluation, a student directory, and the Student Advocate Service. Further information can be obtained from the Student Association office in the Marvin Center.

Student involvement in the governance of the University is also possible through participation in various administrative and Faculty Senate committees, advisory councils of the schools and colleges, selected committees of the Board of Trustees, and specialized bodies such as the Residence Hall Association, the Joint Food Services Board, and the Marvin Center Governing Board. This involvement has helped develop policies and programs beneficial to students and the total University community.

### Engineers' Council

The Engineers' Council is the elected student governing body for the School of Engineering and Applied Science. The council acts as a liaison between the student body, faculty, and administration of the School and the student government of the University in all matters affecting the general interests and welfare of the student body, the School, and the University. The council sponsors a number of services and activities, including *MECHELECIV* magazine, the Annual School Picnic in the fall, and the Engineers' Week and Engineers' Ball in the spring. The council also nominates a graduating senior for the Norman B. Ames Memorial Award each year and manages the Davis-Hodgkins House. The council is supported by the Engineers' Council fee paid by each student in the School, and elections are held in the spring.

***Davis-Hodgkins House.*** The Davis-Hodgkins House is the student center of the School of Engineering and Applied Science, providing lounges, reading rooms, and student organization offices. The house, at 2142 G Street, N.W., provides convenient, comfortable facilities for the exchange of ideas and good fellowship.

***MECHELECIV Magazine.*** *MECHELECIV*, published four times a year by the Engineers' Council, is the award-winning student magazine of the School of Engineering and Applied Science. It contains technical articles and information on campus events and activities. *MELCHELECIV* provides opportunities for SEAS students in all aspects of magazine production, including technical writing, editing, illustration, photography, design and pasteup, and advertising and public relations. The magazine is circulated to all SEAS students and faculty, as well as to members of the administration and alumni who have contributed to the School.

### Student Organizations

Students are encouraged to become involved with existing student organizations or to initiate their own. There are approximately 200 organizations on campus concerning a broad spectrum of interests: academic, professional, international, cultural, political, service, sports, hobbies, recreational, religious, and meditative, as well as social fraternities and sororities. The

following are of particular interest to students in the School of Engineering and Applied Science.

### Honor Societies

***Delta Sigma Rho-Tau Kappa Alpha.*** A national forensic society.

***Eta Kappa Nu (Theta Iota Chapter).*** A national electrical engineering honor society established to recognize scholarship, character, and service.

***Mortar Board.*** A national society for juniors and seniors, stressing leadership, scholarship, and service.

***Omega Rho.*** A national honor society established to recognize outstanding scholarship in disciplines related to operations research and management science.

***Omicron Delta Kappa*** A national society emphasizing leadership in extracurricular activities.

***Phi Eta Sigma.*** A national society established to encourage and reward high scholarship and attainment; limited to those freshmen who attain a scholastic average of at least 3.5 or the equivalent.

***Pi Tau Sigma.*** A national mechanical engineering honor society. Candidates are selected from the junior and senior classes on the basis of sound engineering ability, scholarship, and personality.

***Sigma Xi.*** A national scientific honor society whose purpose is to encourage original investigation in pure and applied science. Outstanding graduate students in the sciences are eligible for full membership, and undergraduates who have shown marked ability in research may be elected to associate membership.

***Tau Beta Pi.*** A national engineering honor society whose purpose is to recognize distinguished scholarship and exemplary character.

### Professional Organizations

***American Society of Civil Engineers (Student Chapter)***
***American Society of Mechanical Engineers (Student Chapter)***
***Institute of Electrical and Electronic Engineers (Student Chapter)***
***IEEE Communications Society (Student Branch Chapter)***
***IEEE Computer Society (Student Branch Chapter)***
***IEEE Engineering in Medicine and Biology Society (Student Branch Chapter)***
***National Society of Black Engineers (Student Chapter)***
***National Society of Professional Engineers (Student Chapter)***
***Society of Women Engineers (Student Chapter)***
***Theta Tau (Gamma Beta Chapter)***

## Athletics, Intramural Sports, and Recreation

The Charles E. Smith Center for Physical Education and Athletics offers many facilities for student use, including courts for basketball, volleyball, and badminton; a jogging track; a swimming pool; wrestling, gymnastic, and weight rooms; handball and squash courts; and a sauna and lockers. Based in the Smith Center, the men's and women's athletic departments offer a broad program of intramural and recreational activities designed to accommodate various levels of skill, experience, and interest.

The University is a member of the National Collegiate Athletic Association and the Atlantic Ten Conference. Its varsity teams compete against major

universities throughout the Midwest and Eastern Seaboard in such sports as basketball, baseball, soccer, tennis, golf, wrestling, crew, swimming and diving, squash, badminton, volleyball, and gymnastics.

## Major Program Events

***Art Exhibits.*** The work of locally, nationally, and internationally known artists is shown in monthly exhibits in the Dimock Gallery in Lisner Auditorium and in the art gallery of the Cloyd Heck Marvin Center. Student art exhibits are presented each semester.

***Concert Series.*** The Department of Music presents a series of concerts featuring faculty, guest, and student artists throughout each year.

***Dance.*** The GWU Dance Company presents major concerts, informal studio performances, experimental events, television appearances, and lecture-demonstrations. Students may audition to become company members and have the opportunity to choreograph, perform, and gain experience in the technical aspects of dance production.

***Glee Club, Jazz Band, and Orchestra.*** The University Glee Club, Jazz Band, and Orchestra are open to students either as credit courses or as cocurricular activities. All of these organizations present major performances to the University community several times a year, including regular winter and spring concerts.

***International Programs.*** The International Student Society presents an annual International Dinner in cooperation with foreign embassies and international restaurants. Other programs include regular forums and speakers on international topics.

***Program Board.*** The University Program Board, composed chiefly of elected and appointed students, is given primary responsibility and resources for student programming on campus. Through its various committees and in cooperation with other campus groups, it regularly sponsors films, lectures, concerts, social activities, and special events.

***Theater.*** The University Theater produces four or five major plays and musicals during the year on the proscenium/thrust stage in the Dorothy Betts Marvin Theatre. Additional works, including original and experimental plays, are produced in a more intimate studio theater. Students can participate in all aspects of theater and may receive credit toward their B.A. or M.F.A. degrees for some of their production work.

# The University

## History and Organization

The George Washington University had its beginning in 1821 as the Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to the George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as president and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of the Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter, which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character, it provided "That persons of every religious denomination shall be capable of being elected trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets and extending north from Florida Avenue to somewhat beyond Columbia Road. The

Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half-century, the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area has many reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first president of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the national university he hoped to see established.

The University as it is now organized consists of the Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the Schools of Medicine and Health Sciences, Engineering and Applied Science, Education and Human Development, Government and Business Administration, and Public and International Affairs; and the Division of Continuing Education.

## University Libraries

The library collections of the University are housed in the Melvin Gelman Library (the general library of the University) and in the libraries of the National Law Center and the School of Medicine and Health Sciences.

These collections contain approximately 1,540,000 volumes, to which are added some 60,000 volumes a year. Endowments supplementing the University appropriation provide research materials in the fields of American civilization, American literature, art history, foreign service, history, labor relations, public finance, the social sciences, and transportation. Gifts from many sources have enriched the collections, including a large National Endowment for the Humanities grant to strengthen the University's humanities holdings. The libraries currently receive about 15,000 serials.

Information concerning the use of the libraries may be obtained at library service desks. Individual and class instruction in the use of the library and orientation to library facilities are given by librarians upon request.

The library strives to fulfill the curricular, research, and recreational needs and interests of the students. Through computerized searches of bibliographic data bases, the reference staff identifies and locates desired research materials not easily found through more traditional methods. The staff assists all members of the University in using the rich resources of the Washington area and the unusual opportunities they offer for extensive research.

Graduate degree candidates at George Washington University may, upon application, be issued a Consortium library card that permits direct borrowing from the main campus libraries of most other academic institutions in the Washington area. Graduate students may also obtain books and journal articles on interlibrary loan from other libraries in the city, throughout the United States, and in various other countries.

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# Facts About
# The George Washington University

| | |
|---|---|
| **General Information** | Private, nonsectarian, coeducational, founded 1821 |
| **Location** | Washington, D.C., bounded by Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. |
| **Number of On-Campus Students** | 9,895 full-time; 7,078 part-time |
| **Geographical Origin of Students** | 50 states, District of Columbia, and over 100 countries |
| **Number of Full-Time Faculty** | 1,198 (91% with doctoral degrees) |
| **Number of Part-Time Faculty** | 524 (includes some of the most distinguished men and women in Washington) |
| **Room and Board** | Cost varies from approximately $4,950 to $5,700 for the academic year (see pages 241–43) |

**Undergraduate majors:** Accountancy, American Civilization, American Literature, Anthropology, Applied Mathematics, Art History, Biology, Botany, Business Administration, Cartography, Chemistry, Chinese Language and Literature, Civil Engineering, Classical Archaeology and Anthropology, Classical Archaeology and Classics, Classical Humanities, Computer and Information Systems, Computer Science, Criminal Justice, Dance, Early Modern European Studies, East Asian Studies (China or Japan), Economics, Electrical Engineering, Elementary Education, Emergency Medical Services, English Literature, Environmental Studies, Exercise and Sport Science, Fine Arts, French Language and Literature, Geography, Geology, Germanic Languages and Literatures, History, Human Services, International Affairs, Journalism, Judaic Studies, Latin American Studies, Liberal Arts, Literature in English, Mathematics, Mechanical Engineering, Medical Record Administration, Medical Technology, Middle Eastern Studies, Music, Nursing Anesthesia, Philosophy, Physician Assistant, Physics, Political Communications, Political Science, Psychology, Radio–Television, Radiologic Sciences and Administration, Religion, Russian Language and Literature, Russian Literature and Culture—in Translation, Sociology, Spanish-American Literature, Spanish Language and Literature, Special Education, Speech Communication, Speech and Hearing Science, Statistics, Systems Analysis and Engineering, Theatre, Travel and Tourism, Zoology

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Graduate School of Arts and Sciences, 1893

School of Medicine and Health Sciences, 1825

National Law Center, 1865

School of Engineering and Applied Science, 1884

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School of Government and Business Administration, 1928

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**Graduate School of Arts and Sciences:** Master of Arts (M.A.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (M.Mus.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Philosophy (M.Phil.), and Doctor of Philosophy (Ph.D.)

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